CHAPTER 3.0—REFERENCE AND EXISTING CONDITION(AFFECTED ENVIRONMENT)

This chapter concisely describes the existing condition of relevant resources of the area that would be affected by the alternatives under consideration if any one of them were implemented. This title should not be confused with the effects in Chapter 4 Environmental Consequences. This chapter, Chapter 3, Affected Environment, establishes the scientific baseline which can be compared to the effects of all action alternatives found in Chapter 4.

This Chapter is separated into the following sections:

3.1.0—OVERVIEW OF EXISTING CONDITIONS

The John Day River system is the only major tributary to the Columbia River which remains undammed and is the second longest free flowing river in the United States after the Yellowstone River. The Galena Watershed consists of 127,341 acres and is defined hydrologically by a segment of the Middle Fork of the John Day River, with about 35 perennial tributaries, and numerous smaller tributaries. The Analysis Area (Galena WA, Supplement—2002) consists of approximately 49,473 acres within the Galena watershed and includes the Davis/Placer, Vinegar, Vincent, Little Boulder /Deerhorn, Tincup/Little Boulder, Butte, and Granite Boulder Subwatersheds.

Generally, according to the *Galena Watershed Analysis, 1999* the primary hydrological characteristics appear to be stable over the entire Galena watershed. Although during field work conducted after this analysis, erosion and concentrated flows were found in intermittent channels and ephemeral draws and from some hill slopes. Spring peak flows tend to be of smaller intensity and longer duration than other locations due to the pattern of snowmelt. While an appearance of stability exists, a number of stream systems are recovering from heavy impacts ranging from the middle of the 19th century through the 20th century. Parts of the area have revegetated covering up some of the remnant impacts from past activity; full hydrologic function has not recovered. These impacts are the result of hydraulic placer mining, high grade logging of the large tree component of fire-resistant trees, railroad and road construction for logging, grazing, and fire exclusion.

Topography

Topography varies from the nearly flat river bottom to gentle slopes at lower elevations, to steeper slopes at higher elevations. The elevation extremes in the watershed range from 3,700 feet to 8,100 feet. The elevation along the river ranges from 3,700 feet at the west end of the watershed to 4,000 feet at the east end of the watershed, a change in the river's elevation of 800 feet in 8 miles. The topography varies from flat meadows along the Middle Fork of the John Day River to moderately steep side slopes with occasional upland flats. Gentler slopes with abundant depositional features are present in lower portions of the subwatersheds. The streams are moderately to deeply entrenched. The Middle Fork of the John Day River occupies a structurally controlled, alluvial floodplain with moderate valley gradients and river terraces. Aspect is determined generally by the location on either side of the valley, either north or south, although the presence of side slopes modifies an overall trend toward south facing slopes (see Appendix E, Map1 Subwatersheds and Topography).

Climate

The climate is semi-arid and transitional between the maritime and continental regimes. The watershed receives about 25-35 inches of precipitation per year, 80 percent of this is snowfall. Rains in fall, winter, and spring contribute to surface run-off and annual discharge. Classic rain-on-snow events appear rare.

Short duration, high intensity summer storms are common as are gentle spring and fall rains that often become snowfall at higher elevations. Short duration/high intensity convective storms in the summer may release intense rainfall over a small area. The John Day basin is recognized as having some of the most intense two-hour rainfalls in the state of Oregon. Intensity is thought to range from about 0.25 inches in 60 minutes; to 0.4. inches in 9 minutes.

Geology

The analysis area is located in the Blue Mountain physiographic province of Oregon, which lies between two major physiographic provinces, the Deschutes-Columbia Plateau to the north and the High Lava Plains to the south (Orr, Orr and Balwin 1992). The outstanding geological features are its complexity, which is reflected in the distribution of the soils, and the presence of several, very different formations which are normally stable, but can become less stable under different conditions and by different mechanisms. Generally, the south side of the watershed is less complex than the north side, although locally there may be some intermixing of formations. Alluvial deposits are predominant along valley bottoms near the Middle Fork of the John Day River. A large area of stable ancient landslide debris (Quaternary) is found on the north side of the river, primarily in Little Boulder/Deerhorn subwatershed.

Existing Scenic and Ecological Integrity

Currently this area shows very little evidence of recent past logging practices within the past 25 years, other than the clear cut patches on Dixie Butte and the logging/blowdown area on the FS Rd 2010. In foreground views, old stumps are visible. Middle and background views are primarily intact. The dispersed sites show damaged vegetation and bare and compacted soils.

Logging and suppression of fire has resulted in the loss of a large tree component and the current establishment of a dense multi-storied stands of trees. This has reduced the scenic integrity to moderate.

3.2.0—EXISTING CONDITIONS

Ecological integrity is an indication of the sustainability of a landscape, which affects the long term conditions of landscape aesthetics. The existing ecological integrity is determined by considering the current condition of key resources and the current trends. Currently there are trends that indicate that the ecological integrity is in poor condition. Early season peak flows of water now leave the landscape of the analysis area in a much more rapid manner than they once did under historical conditions, this in turn has caused low water levels and a decreased water storage function during dry summer months when aquatic species need it most. An elevation in stream temperatures is a factor vital to these species as well (see 3.2.1—Early Season Peak Flows, below, 3.2.2—Stream Temperatures, page 124 and 3.2.3 Aquatic Habitat, page 125). The Dry Forest and other forest types are overstocked, with excess ground and ladder fuels. The suppression of wildfire and early logging methods have caused a change in the composition of tree species as well as structural stage composition (see 3.2.4 Vegetation by Forest Type, page 139, 3.2.5 High Wildfire Hazard, page 159,and Fire Exclusion Policies and Fire regimes, page 211). The trends described in this chapter are critical to the ecological integrity of this landscape because the condition of the forest and streams affect many other resources. [46]

3.2.1—EARLY SEASON PEAK FLOWS

Duration of peak and near peak stream flows in the early spring is increased in the analysis area streams because of residual effects of past resource utilization. It is believed that the drainage systems (including some uplands and the roadless areas), have been altered in ways that increase duration and volume of peak and near peak flows over at least 70-80% of the area. Additionally, locally intense summer thunderstorm events (causing resource damage in one subwatershed and not in adjacent ones) occur in this part of the State of Oregon. The increase in peak stream flows is due to a combination of factors, two of which are: 1) the loss of channel sinuosity and 2)instream woody debris. Another is the degradation of both upland and riparian vegetation as well as soils. Historic livestock over-grazing (1930s and 1940s and earlier) has led to soil loss and diminished ground cover. Soil compaction on roads, skid trails and landing sites from logging operations contributes to increased runoff of surface water across the landscape. The loss of canopy cover in the greater Galena watershed is primarily from recent uncharacteristically severe wildfire adjacent to the analysis area which has accelerated snowmelt in the spring (see Recent Uncharacteristically Severe Wildfire, page 159).

Roads and associated ditches intercept both overland water flow and groundwater across the landscape, and concentrate runoff which is delivered to stream courses more rapidly than under natural conditions.

Increased peak flows have contributed to stream channel down cutting, which has in some instances disconnected floodplains (generally disconnected 50 or more years ago) from the stream channel and consequently have lowered water tables. These floodplains no longer act as “sponges,” which capture surface flow and store ground water for late season release. Additionally, the removal of beaver from the analysis area has contributed to the decrease of wetlands and other storage areas associated with beaver dams that historically retained water on the landscape year-round. Beaver are beginning to return to the watershed in small numbers. (see Beaver Activity, page 135).

Riparian meadows along the Middle Fork John Day, with the exception of federal land, have been converted to agricultural use (currently cattle grazing on private land). Meadows used by earlier

[46] “Southeast Galena Landscape Aesthetics Report,” specialist report, analysis file by Mattson, D., Landscape Architect, Wallowa-Whitman National Forest

settlers have undergone species conversion through loss of the water table. As a result, moisture-loving species such as tufted hair grass and common camas have been replaced with Kentucky bluegrass, meadow foxtail, and other "pasture" grasses, and weedy increasers such as teasel. Smaller riparian meadows at higher elevations have suffered from on-going overuse, sometimes by large numbers of elk as well as cattle, with a resultant conversion to sedges and rushes, or to Kentucky bluegrass if the water table has dropped.

Overview of Soils in the Analysis Area

Since the *Galena Watershed Analysis* was written in 1999, additional observations and interpretation of local conditions have expanded the understanding of soils, erosion and sedimentation processes, and effects of historic human activities on the soil resource.

The soils in the analysis area, particularly on the north side of the watershed, are variable and the pattern of distribution is complex as described in the *Galena Watershed Analysis* and displayed in Table 87, page 115. This table includes groups of intermingled soils (soil complexes) which are classified according to the predominant soil type; these complexes often include large proportions of clayey or loamy, non-forested soils (described below). The complexity of the natural soil mosaic has been increased by the effects of various kinds of disturbance that have occurred during the last 150 years. The characteristics of some soils will not recover for 50 years. In some places recovery will occur over geologic time. Also, similar soils may respond differently to similar management activities, adding to the complexity.

As a result of past activities, detrimental soil conditions are present in some locations (as defined by FSM 2500, R-6 Supplement 2500-98-1). These are generally areas where either mineral soil has been exposed or where activities have affected the structure of the surface or subsurface soils. Forest-wide Standard 126 states that no more that 20 percent of an activity area may be in detrimental condition following the completion of an activity. A review of the planning area indicates that it meets this standard.

Description of Soils

Surface soils in the analysis area tend to be shallow ranging in depth from about 6 inches to 24 inches and, rarely, up to 36 inches.

Presence or absence of a cap of volcanic ash, usually 8-24 inches deep, causes important variation among soils (see Table 87, page 115).

Ash soils tend to absorb water rapidly; non-ash soils tend to absorb water more slowly, increasing the risk of surface runoff. Ash soils tend to hold more water available for the use of plants, so ash soil tends to have more ground cover.

The combination of rapid absorption of water and more ground cover tends to cause a low to moderate erosion risk on ash soils; non-ash soils tend to have a low to very high erosion risk, depending on ground cover, slope, soil depth, and other factors.

Erosion risk increases on dry ash soils when either of two unusual characteristics develop: 1)when very dry, ash soils tend to be hydrophobic; 2)when moistened, following extremely dry conditions; dry ash soils tend to aggregate into lumps (flocculate). Either condition increases the ease with which overland flows of water are concentrated rather than absorbed, increasing risk of erosion. Ash soils over droughty granitic subsoils, are more susceptible to this hydrophobic process.

Ash soils tend to be found at middle elevations up to the sub-alpine zone throughout the analysis area (see Hydrology report Analysis file).

Non-ash soils are common in numerous places (often intermingled with areas of ash soil). This occurs within the analysis area in the following locations: in a belt about 1.2 miles wide northeast of the Middle Fork. of the John Day River; additionally in most of the Vincent Creek., Caribou Creek. and Flat Creek. Drainages; a belt about 0.9 miles wide southwest of the Middle Fork, southeast of Deerhorn Creek; the northeastern part of the Vinegar Creek Drainage; the lower 2.3 miles of the Butte Creek Drainage; and in Sub-alpine areas.

The distribution and diversity of subsoils is another important source of variation (see Table 87, page 115) that may affect management activities. Clayey subsoils derived from the Clarno, meta-sediment bedrock, and the volcanic bedrock tend to absorb water slowly, to transmit it through the ground slowly, and to hold it longer, tending to cause high erosion and rutting risk in the subsoil. These subsoils are more widely distributed than the similar surface soils as some underlie the ash surface soils.

Other subsoils, derived from less clayey bedrock, tend to either absorb water more rapidly or to transmit it more rapidly, reducing erosion risk to low to moderate in the subsoil. Granitic subsoils tend to be absorb and transmit water rapidly. They tend to erode rapidly into gullies once erosion is initiated because of their easily detached sand particles. They are also droughty soils due to high porosity. At high elevations this tendency combined with a short growing season tends to produce soil conditions that are difficult to revegetate.

Generally, the soils at lower elevations and those too shallow to support trees tend to absorb a smaller proportion of precipitation, with a larger proportion running off. Soils, including parent bedrock, at middle and upper elevations (with the exception of high elevation meadows and locations where soils are shallow) generally absorb more water or transmit it more efficiently.

For instance, clayey surface soils over clayey subsoils and parent bedrock tend to contribute the greatest proportion of precipitation as runoff, to shed water faster than other soils, and to hold what water is absorbed longer. Clayey soils over clayey subsoils with high rock content are difficult to manage because of the large variation in particle size. Ash soils over clayey subsoils can "wet up" quickly following rainfall and then contribute a greater proportion of precipitation to run-off. The clayey subsoil holds water longer than the surface ash, contributing to problems which were caused by previous ground-based activity. Ash soils over granitic subsoils tend to be droughty, generally with relatively few erosion problems, but re-establishing vegetation after loss may be difficult.

Water is the limiting factor for plant growth on most soils in this watershed; it is more limiting on residual soils than on ash soils.

Table 87—Soil Types (acres)— Based on Soil Hydrology and Productivity by Subwatersheds (SWS)[47].

SWS / Soil Type	Butte Creek	Davis Creek/Placer Gulch	Granite Boulder Creek	Little Boulder Creek/Deerhorn	Tincup Creek/Little Butte Ck	Vincent Creek	Vinegar Creek	Grand Total
Ash over clayey forested	1,218			270	2,021	31	1,736	5,276
Ash over granitic			700	667	842	245	84	2,538
Ash over serpentine		164	629	987		945	240	2,965
Clayey forested			187	127	973	280		1,567
Clayey non-0forested	364	1,042	52	2,428	1,314	642	402	6,244
Miscellaneous	1,045	162		1,083	276	1,024	87	3,677

[47] Total acres do not include land within adjoining Forest boundaries (Umatilla NF and Wallowa-Whitman NF).

sensitive								
Other	2,234	6092	5,110	5,111	2,004	503	4,606	25,660
Serpentine - residual				313		97	14	424
Grand Total	**4,861**	**7,460**	**6,678**	**10,986**	**7,430**	**3,767**	**7,169**	**48,351**

Soil Disturbance

Above the continuous forest cover on Vinegar Hill and on Dixie Butte, the soil profile was disrupted by erosion following loss of ground cover around the turn of the century (1900). This was caused by the topsoil layer in high elevation meadows being lost and plant associations modified following the intensive sheep grazing which occurred about 100 years ago (Hall, 1973 and Johnson, 1992). These areas have been described as so degraded that surface soils and productivity will recover only over geological time (Hall, 1973, Johnson, 1992).

Some of the degraded soils , based on the Malheur National Forest Soil Resource Inventory (SRI), coarse mapping, by vegetation specialists, and satellite imagery, are shown in Table 88, below.

Table 88 Historic Soil Disturbance by SWS (Estimated)

SWS Name	Subalpine Steppe (Max Acres)	Total Acres 5000'+ Elev.	Historic Mining (acres)	Historic Mining Miles of Stream
Davis/Placer	Not estimated	Not estimated	1000	10
Vinegar Creek	1,500	5,500	1500	20
Vincent	0	N/A	600	10
Deerhorn/Little Boulder Creek	500	2,900	600	10
Butte Creek	Not estimated	Not estimated	1000	10
Granite Boulder Creek	1,500	5,800	1000	10

Hydraulic placer mining has left large areas of mineral soil, spoils or bedrock exposed locally, or created gullies as displayed in Table 88. While some areas have begun to recover, others are probably not capable of revegetating naturally in human time. In addition it is suspected that historic cattle and sheep grazing may have altered run-off patterns on low and mid-elevation Clarno (clayey) soils in much of the area that was also affected by railroad logging.

Commercial timber harvest, both skyline and tractor, has occurred over the last 80 years. Soils in draw bottoms and along stream channels below about 4800 ft. were altered during railroad logging in the first half of the twentieth century. Surface layers were displaced, compacted or eroded, sometimes exposing subsoils. Railroad logging, with its associated horse and early tractor skidding and rail line activities, occurred primarily on areas with clayey, loamy forested soils, non-forested soils with inclusions of forested soils, and occurred in areas where ash overlays of sensitive, clayey subsoils are found.

These early activities caused subsurface soils to be exposed and erode in some areas. Rills and gullies formed and streams were down cut and expanded headward. Today these areas continue to concentrate overland flow of water and are at risk of further erosion if concentrated flows are channeled to them. This would result in the increasing erosion risk down slope and in stream channels and in riparian areas below the affected areas.

A few of the current erosion problems have been linked directly to recent tractor logging, these however, were primarily where best management practices were not implemented, or where they were poorly implemented before the current *Land and Resource Management Plan* was in effect. Disturbance from tractor logging using best management practices would still expose mineral soils and compact these soils, thus increasing erosion risk over undisturbed conditions.

Compaction from harvest during the last 40 years is still impacting soil. Table 89displays area harvested within about the last 25 years by subwatershed. About half of the area was harvested without Best Management Practices. Generally, tractor harvest occurred on greater than half of the more recently harvested area. Of the areas previously harvested by tractor, it is estimated that a range of about 12 to 17 percent of the harvested area (or up to 2% of the analysis area) may be detrimentally compacted along skid trails and in landings. In skyline units, this percentage is generally under 10% of the harvested area. These percentages meet *Land and Resource Management Plan* standards, even when the adjacent roads are included in the estimate.

Table 89— Harvest Activity during the Past 25 Years by SWS

Soil Type	Subwatersheds Acres							
Subwatersheds	Butte Creek	Davis Creek/Placer Gulch	Granite Boulder Creek	Little Boulder Creek/ Deerhorn	Tincup Creek/ Little Butte Ck	Vincent Creek	Vinegar Creek	Grand Total
Ash over clayey forested	311				67	9	351	738
ash over granitics			216	210	324	8	0	758
ash over serpentine		33	11	446		113	66	669
Clayey forested			153	79	117	38		387
Inclusions clayey non-forested	59	52	43	1092	223	96	79	1644
Miscellaneous sensitive	66			303		74	16	459
Other	290	718	1328	144	244	59	621	3404
Serpentine -residual				40		29	1	70
Grand Total	726	803	1751	2314	975	426	1134	8129

Roads and Other Soil Disturbance

Roads—cause soil disturbance within the road corridor and downslope of any channeled run-off (Gucinski, 2000). Soil is compacted and may become rutted. Soil layers on cut and fill slopes are mixed and often poorly vegetated.

Other activities have exposed mineral soil or caused small areas of compaction commonly throughout the analysis area. These include livestock concentration, commonly due to salting or trailing, such as that found along road 2010-159. Livestock concentration in some riparian areas

such as those along upper and lower Deerhorn, Davis and Placer Gulch creeks is causing localized stream bank disturbance. ATV use, especially on the south side of the river, is creating bare, tracked areas, (see ATV use and Other Sources of Erosion, page 122). Bare soil has been exposed at some dispersed campsites. Commonly, riparian soils have dried out and valley bottom soils have become compacted and eroded by past logging, grazing, and associated activities such as railroad logging camps and work areas.

Soil crusts are believed to have existed on most of the clayey non-forested soils prior to 1860. Grazing and activities associated with logging and other human activities have caused loss of these soil crusts, probably by physical disruption first and then erosion. The process of recovery of soil crusts is not well understood.

Wild fire has not impacted soils in the Southeast Galena analysis area in the last 150 years based on a preliminary evaluation of stand composition and age. Current fuel levels are expected to support an uncharacteristically severe wildfire similar to the Summit Fire which is likely to result in soil damage such as water repellency, a tendency to lump (flocculation), ground cover loss, accelerated erosion, and stream channel modification.

Mycorrhizae and soil macro invertebrate populations are considered to be at natural levels and of natural species composition over most of the area. Past harvest and planting practices may have converted the macro invertebrate populations to ones more typical of grasslands on about 100 acres primarily in Deerhorn/Little Boulder subwatershed.

Erosion Processes—Overview

Much of the analysis area, primarily because of its vegetative cover and distribution of soils, appears to be processing overland flows, including those associated with high intensity, short duration storms, without developing visible rilling, sheet wash, channeling or gullying. Where human disturbance has exposed mineral soil, erosion is increased over natural rates. In isolated places, accelerated erosion is occurring because of the amount or depth of exposure of mineral soil from past activities and subsequent erosion. Both surface erosion and mass slope movements are naturally present. The natural rate of occurrence of these processes is increased by disturbance.

Soil creep is common on exposed, generally shallow or poorly vegetated soils and increases with disturbance. Naturally occurring slumps are rare; slumping increases with disturbance.

The overall trend in erosion risk, since early management activities were implemented, is stable. The degree of recovery of eroded areas is variable, as described in the Soil Disturbance section, depending on the type of impact that occurred and local conditions. Some areas previously disturbed are recovering. Current management activities are implemented with increased erosion controls. In isolated places where ground cover is not measurably recovering, erosion risk remains elevated, and will remain elevated, and may increase as, “accelerated erosion,” through geological time.

Ground cover remains low by definition in some areas (open roads). In others (landings, skid trails, decommissioned roads), it is expected to recover gradually unless initial recovery was delayed and erosion subsequently became concentrated. Some historical activities reduced ground cover and, possibly, the potential to produce ground cover in human time (compared to geologic time).

Management activities have also altered soil structure modifying its ability to absorb, transport and move water.

Surface Erosion

Natural surface erosion risk in the analysis area ranges from low to very high, depending on the soil, according to the SRI, and as displayed in the Galena EAWS. Table 86 page 115 shows soil types by subwatershed.

Naturally thin, clayey or rocky soils with high erosion risk cover about 6200 acres of the analysis area as shown in Table 86 page 115. These are the clayey, loamy, non-forested soils described previously.

Most of these areas are now in a stable condition because overgrazing has been curtailed and logging is conducted with best management practices. These areas continue to produce more overland flow and surface runoff, which may erode downslope areas.

Past erosion has scoured rills, gullies and channels, some of which are still active, at lower elevations, especially on the north side of the Middle Fork John Day River, in Deerhorn/Little Boulder, Little Butte/Windlass, Vinegar and Davis/Placer Gulch subwatersheds, where surface run-off is concentrated due to disturbance of ground cover and soil structure by past activities.

Activities, which exposed mineral soil or modified soil structure, have increased erosion risk on other soils. On the approximately 5300 acres of shallow ash and loamy surface soils, which overlie clayey subsoils, erosion risk is increased when the more erosive subsoils are exposed. Roading is the chief cause of subsoil exposure and is discussed in the Roads subsection (page 120).

Granitic subsoils (about 2500 acres), if exposed, tend to erode, producing sand particles that are easily detached and transported. Past activities (skidding, mining and roading) in Little Boulder/Deerhorn, Little Butte/Windlass, Granite Boulder and Vinegar subwatersheds have left areas where granite particles are raveling down slope, although the subsoils are not fully exposed. Road ditches and culvert intake basins down slope of these areas are at risk of filling with sediment relatively quickly.

Soils classed as miscellaneous have variable erosion risk based on individual soil types and uncommon characteristics. Soils with low to moderate erosion risk show rilling and gullying in limited, disturbed locations associated with roading or logging in Deerhorn/Little Boulder and Little Butte/Windlass subwatersheds

Areas with increased erosion risk are generally limited in size. They are moderately frequent and well distributed across the landscape. Some areas of surface erosion are healing slowly where organic material is accumulating. Some areas are gradually deepening or widening. Erosion is accelerating at a few locations where other disturbances channel concentrated surface flows and concentrated flows become connected. For example, upland rilling, sheet wash, and related processes initiated by grazing a century ago in the sub-alpine steppe became concentrated enough over time cause a debris torrent in Lemon Creek in 1998. Combination of flows from a former salting ground off the 2010-159 road and the road itself caused rilling in an ephemeral swale and eroded an unnamed intermittent channel headward just west of Vincent Creek. Erosion following similar activities have caused gullying in Tincup and Windlass subwatersheds. There are 1450 acres of areas with erosion risk of this type across the analysis area.

Slope Movement

Soil creep is the most common form of slope movement found in the watershed and similarly in the analysis area. Mass slope movements in the form of slumps and earth flows have occurred with at least 4 observed (Galena WA 1999) events in the analysis area and other slumps and earth flows are suspected. Shallow/rapid movements that produce massive impacts over a very short period are uncommon. The only known example is the debris/avalanche chutes on the east and northeast

flanks of Dixie Butte in the Deerhorn drainage. No other similar areas have been identified within the analysis area. Sediment from mass failure is less common than on the west side of Oregon although more common than in the wetter, eastern part of the United States.

Slope movement which has been observed in the analysis area, is most common on the Clarno and similar formations. Elsewhere on the Malheur National Forest, areas of serpentine rocks are noted for instability; instability has not been observed on serpentine areas in Vinegar Creek and Vincent Creek drainages. Generally, other rock types are stable, although each rock type has structural features which could contribute to slope movements.

Four events, in addition to the debris/avalanche chutes in Deerhorn drainage, are documented in the analysis area with about 30 more similar events documented in other parts of the watershed or adjacent watersheds. With the exception of the Lemon Creek debris torrent, the relatively small slope movements in the analysis area have only minor impacts associated with them to date, although larger ones elsewhere in the watershed have had greater impacts. The slope movements in the analysis area are relatively small, ranging from 1000-5000 cubic yards of displacement. The Lemon Creek debris torrent, which occurred in July, 1998, while moving only about 3000-4000 cubic yards of material, substantially altered the channel of a tributary to a stream with threatened species of fish (bull trout). It followed extensive rilling that was initiated over 100 years ago by heavy grazing.

Two of the slumps in the analysis area occur along County Road 20, near Butte Creek and west of Vincent Creek. Road related movements are caused either by undercutting of natural slopes by road construction or where roads or other ground disturbing activities altered natural surface and subsurface drainage. A dry, raveling mass movement in Blue Gulch, the fourth documented in the analysis area, may be natural or it may be related to a nearby mid-slope mining ditch. A second, smaller movement was observed nearby but not documented during survey.

Roads and Erosion

Roads affect geomorphic processes by four primary mechanisms (Gucinski, 2000).

Roads accelerate erosion from the road surface and prism itself by both mass and surface erosion processes. In the analysis area (see Roads page 231), erosion is generally highest on native surface roads with poorly designed drainage, regardless of soil type. Specific mechanisms contributing to erosion on these roads vary with soil type. Concentrated flows, especially in Clarno and volcanic soils, detach particles of clay, silt and, to a lesser extent sand. The clay particles and some of the silt are carried away as turbidity; the remaining silt particles are moved and deposited. On granitic soils, irregularly shaped sand and fine gravel particles are moved.

Road segments with gravel or other rocked surfaces do not usually show signs of rutting after use in inclement weather, although turbid flow among the surfacing particles has been observed. Travel on native surface and inadequately graveled road segments also results in turbid surface flow whenever water flows on the road. When poorly drained conditions occur near streams, ditch relief culverts, or areas with soil disturbance—these flows may reach stream channels causing turbidity in streams.

Photo 12— Travel on native surface and inadequately graveled road segments also results in turbid surface flow whenever water flows on the road.

Most roads, regardless of soil type, produce dust under dry conditions and, especially, during heavy haul, which may enter streams from the air or during runoff. Loss of dust and other fines also contributes to the more rapid degradation of the road surface and increased erosion.

Generally, annual sediment accumulation (primarily silt) in ditches has been observed as a trace to a deposit less than ½ inch deep annually over variable lengths except where water backs up and puddles. Generally 80% of ditches are vegetated, reducing sediment contributions originating from or transported by roadside ditches.

Widely spaced relief culverts promote ditch erosion when vegetation is sparse or when flows increase. Erosion along roads appears to be primarily a seasonal problem. It is directly affected by the condition of the road, drainage design, surfacing, and amount and type of use under wet conditions. Popular periods of use include the wet seasons, during and after snowmelt and during fall and spring rains. Roads directly affect channel structure and geometry.

It has been estimated that currently about 25 percent of the culverts are too small to pass 100 year storm events.

Table 90 reflects a summary of problem road segments from an informal survey of 69 road segments (see Analysis File, Watershed and Soils Report).

Table 90— Summary of Road Segments with Problem Areas

SWS	Davis/ Placer	Vinegar	Vincent	Deerhorn / Little Boulder	Little Butte/ Windlass	Butte	Granite Boulder
Number of problem road segments described	21	10	17	11	1	2	N/A

Table 91 Summary of Road Segments and Miles in RHCAs by Drainage Condition (estimated).

SWS / Drainage Condition	Davis/ Placer	Vinegar	Vincent	Deerhorn /Little Boulder	Tincup/ Little Butte	Butte	Granite Boulder	Total
	# segments/miles							
Currently Decommissioned (drainage self-maintaining)	92/ 4.6	55/ 2.3	84/ 4.8	39/ 2.8	20/ 0.6	52/ 3.0	35/ 1.5	377/ 19.4
Culverts undersized, misaligned, etc. on open or closed roads	58/ 1.4	26/ 0.5	0/ 0	12/ 0.6	20/ 0.6	11/ 0.5	15/ 0.4	142/ 3.9
Flow concentrated at crossing on open or closed roads	76/ 1.9	92/ 3.4	95 4.1	93/ 3.7	47/ 1.3	48/ 2.2	97/ 3.9	548/ 20.5
Currently open or closed with adequate drainage or condition unknown	159/ 6.7	147/ 5.4	67/ 3.1	114/ 5.8	132/ 6.6	79/ 3.2	147/ 5.4	845/ 36.1
Road crossings	121	125	90	113	73	74	102	708
Total	385/ 14.6	320/ 11.6	246/ 12.0	258/ 12.9	219/ 9.1	190/ 8.8	294/ 11.1	1912/ 80.0

ATV use and Other Sources of Erosion

All Terrain Vehicles use of the Davis Creek Motorized Trail is causing erosion at nine stream crossings where the current crossings are too narrow to accommodate All Terrain Vehicles (ATV's). Because these crossings were designed for "trail bike," motorcycles. ATVs are crossing adjacent to the current trail, exposing mineral soil in the stream banks; at some locations there are multiple tracks. ATV use, especially on the south side of the river, is creating bare tracked areas, primarily in the subwatersheds which are traversed by the Davis Creek Motorized Trail and at stream crossings along the Trail.

Mineral soil is exposed in the Murdock dispersed campsite where sediment is being detached and transported. Additional locations are potential sources of erosion and sedimentation as recreation impacts become more concentrated on riparian soils (see 2.5.5.3 Description of Dispersed Campsite Projects page 89).

The Oregon Department of Fish and Wildlife (ODFW) stream survey identified a high percentage of eroding river banks along the Middle Fork of the John Day River. These may be attributed to management along some segments of the river and possibly because of increased peak flows entering the watershed from the flashier—Upper Middle Fork Watershed up river from the analysis area.

Additionally, there is a vulnerability of soils to erosion following high intensity, short duration, storm events. (See Issues 1.4.1,. 1.4.2, and 1.4.3—page 31).

Hydrologic System, Water Quantity, and Water Timing—Departure from Potential

It is estimated that In-and Off-Channel water storage capacity has been reduced on approximately 70-90% of stream channels and on or about 200-500 acres of flood plain, wetlands, seeps, and other riparian areas adjacent to the stream network within the analysis area. The magnitude of in-channel changes may be estimated by how much stream reaches depart from *Land and Resource Management Plan* standards, or from generally accepted geomorphic measures. In the analysis area, preliminary analysis indicates that large woody debris and pool frequencies are at 10-90% of the expected condition, indicating similar percentage losses of water storage areas along these same surveyed streams. Historic logging , mining, and grazing in addition to more recent road building, have contributed to the decrease in storage capacity.

In addition run-off has increased on about half of the ephemeral draws(length not estimated) and on the valley bottoms (about 200 stream miles) along most of the intermittent, perennial , and fish bearing streams over about 35,000 acres (low to id elevations), previously logged by railroad. Accelerated runoff also occurs on about 3000 to 5000 acres of hill slope most commonly found at high elevation (where soils were altered by mining or sheep grazing). Several steam channels (estimated at about 25 to 30 stream miles), including most of Vinegar, Vincent, Placer Gulch, Davis and Granite Boulder Creeks and their tributaries were modified to various degrees by different kinds of mining, accelerating run-off or reducing water storage. Segments of several other streams (estimated at about 10 to 30 stream miles), either at the head waters or at lower elevations were similarly modified by mining activities. Roads and ditches intercept soil water. The effects of roads increased over time proportionately to the miles of road , numbers of crossings, season and amount of use and type of construction. A substantial increase in roading occurred in the 1980s.

These activities resulted in channel down cutting and straightening. Connections to flood plains as a result were reduced. Channels appear to be stable at new elevations during normal peak flows. The channels' ability to handle the energy associated with high flows that accompany rare climatic events[48] is considered reduced.

Watershed processes over much of he area have been altered because of changes in he condition of the components of the hydrologic system. Alteration of natural process began in the early and mid-nineteenth century and continue today. It is believed that summer base flows have been reduced because water runs off faster, generally increasing and extending he duration of peak and near peak flows.

(See also, ***ISSUE 1.4.1—Restricted Access****, page 30 and 327;* ***ISSUE 1.4.2—Effects of All Terrain*** Vehicle (ATV) use*, page 31 and 330;* ***ISSUE 1.4.4—Effects of Heavy Equipment*** in RHCAs*, page 31 and 347; and* ***ISSUE 1.4.7—Blow down in Vincent/Vinegar*** RHCAs*, page 32 and 362.)*

[48] 25, 50, 100-year or greater flood events.

3.2.2—STREAM TEMPERATURES

The listing of a number of streams within the Analysis area on the State 303(d) list has focused attention on this issue. The State 303(d) list is prepared by the State of Oregon's Department of Environmental Quality, which identifies streams in non-compliance with the Federal Clean Water Act.

An important stream attribute in the Analysis Area (Galena WA, Supplement—2002)is water temperatures for bull trout spawning and steelhead rearing. Optimum water temperatures for Bull trout spawning[49] is below 48°F. Rearing temperatures for bull trout are 54ºF or below. Optimum steelhead rearing temperatures are less than 64ºF. Spawning temperatures are rarely an issue for steelhead, as this species spawn in the spring when streams exhibit lower temperatures due to ambient air temperature and runoff from snowmelt (higher levels of cooler water are present).

Some of the current concerns within the Southeast Galena Project are:

- Lower reaches of tributaries (in 8 locations) and the Middle Fork John Day River main stem (in 2 locations) do not meet State Water Quality Standards for summer rearing temperature (64°F);
- All 9 lower tributary segments sampled exceed State Water Quality standards (summer rearing temperature, 64°F) for 6-15 days most years;
- 2 of these segments do not meet standards 16-30 days most years;
- 2 of these segments do not meet standards 46-60 days most years;
- 2 of these segments do not meet standards over 60 days most years;
- Water temperatures at the two Middle Fork of the John Day River locations exceed standards 46-82 days most years;
- Two of the tributary segments in occupied bull trout habitat do not meet the standards for waters that support Oregon Bull Trout (50°F).

The Middle Fork of the John Day River is listed on the Clean Water Act, State of Oregon Section 303(d) List of Water Quality Impaired Bodies for flow modification. Withdrawals made from Forestland within the planning area under privately held, certified water rights totaling about 12.55 cubic feet per second (cfs) and are described in the Galena Watershed Analysis (1999 Galena EAWS). Most of the water withdrawn under water rights is used to flood irrigate riparian meadows along the Middle Fork of the John Day River.

Water temperatures are influenced by several factors and complex physical hydrologic processes including flow modifications (c.f., Section 1.2.3), amount of shade, wetted channel width-to-depth ratios, and channel characteristics (see pages 30-32). Many of these factors and processes have been changed as a result of activities that have occurred in the analysis area (see 3.2.1—Early Season Peak Flows, page 113). Peak and near peak flows occur earlier and are larger than historical conditions. Late season flows are of longer duration and smaller in magnitude. Hill slope and stream channel characteristics promote rapid runoff. Riparian storage capacity is reduced. Other factors and processes which contribute to elevated temperatures include: the total amount of activity and distribution of activities relative to stream channels; the erosion hazard and other soil characteristics of the lands being utilized; and additionally, the extent and magnitude of residual disturbance created by past activities (c.f., 3.2.1 page 113).

Approximately 70 out of 150 miles of fish bearing and perennial streams in the analysis area were surveyed for shade in the early and mid 1990s, a preliminary analysis indicates that about 70% (approximately 50 stream miles) do not meet *Land and Resource Management Plan* standards for

[49] Bull trout spawning occurs from August through November

shade (LRMP Amendment 29). Most of the 30% of the surveyed streams that meet this standard are in Ponderosa pine ecosystems (Dry Forest), not in mixed conifer (Moist Forest) ecosystems. Potential shade in Ponderosa pine ecosystems is believed to be greater than shown in the standard. The Riparian hardwood shrub component that would be expected under an open canopy is not incorporated into the standard. Riparian hardwoods are believed to be reduced in abundance, vigor and diversity due to past resource utilization and changes in stream channel and valley bottom conditions. Consequently shade in ponderosa pine ecosystems (Dry Forests), is reduced. Based on preliminary analysis it is estimated that 50-70% of the analysis area's streams do not meet *LRMP* standards for wetted channel width-to-depth ratios. It is estimated the 70-90% of the areas streams do not meet *Land and Resource Management Plan* standards for pool frequency either.

The condition of small perennial and intermittent streams and ephemeral draws contributes to elevated stream temperatures . It is estimated that of the small perennial streams, 70% do not meet shade standards. About 50% of intermittent streams and ephemeral draws have conditions (see 3.2.1—Early Season Peak Flows, page 113) which contribute to accelerated runoff and thus contribute to elevated stream temperatures.

Streams within the analysis area identified on Oregon's Approved 1998 Section 303(d) List of Water Quality Limited Waterbodies are listed in Table 91 which follows.

Table 92 List of Water Quality Limited Streams

Stream/River Name	Parameter	Criteria	Season	Supporting Data
Caribou Creek	Temperature	Rearing 64°F	Summer	USFS data, site near mouth
Davis Creek	Temperature	Rearing 64°F	Summer	USFS data, site at FSR 2614 crossing
Granite Boulder Creek	Temperature	Bull Trout 50°F	Summer	USFS data, 3 sites
Middle Fork John Day River	Flow Modification		Summer	Spring Chinook, summer steelhead limited by rearing conditions not met due to water withdrawal
Middle Fork John Day River	Temperature	Rearing 64°F	Summer	USFS data, 2 sites
Little Boulder Cr	Temperature	Rearing 64° F	Summer	USFS data, site near mouth
East Fork Little Boulder Creek	Temperature	Rearing 64° F	Summer	USFS data, site near mouth
West Fork Little Boulder Creek	Temperature	Rearing 64° F	Summer	USFS data, site near mouth
Placer Gulch	Temperature	Rearing 64° F	Summer	USFS data, site at FSR 2614, west 1.5 miles
Ragged Creek	Temperature	Rearing 64° F	Summer	USFS data, site at FSR 2045
Vinegar Creek	Temperature	Rearing 64° F	Summer	USFS data, site 15 meters above fish screen on FSR 120

Recent data obtained from these streams have shown elevations above critical temperature and/or below minimum flow for native fish.

*(See also **1.2.1.2 Undesired Condition: High Stream** Temperatures, page 10 **ISSUE 1.4.1—Restricted Access**, pages 30 and 327 ; **ISSUE 1.4.2—Effects of All Terrain** Vehicle (ATV) use, pages 31 and 330; **ISSUE 1.4.4—Effects of Heavy Equipment** in RHCAs, pages 31; and 347 and **ISSUE 1.4.7—Blow down in Vincent/Vinegar** RHCAs, pages 32 and 362.)*

3.2.3 AQUATIC HABITAT

[3.2.3]The United States Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) respectively, have listed the Columbia Basin Bull Trout and Mid-Columbia River summer-run Steelhead as Threatened, under the Endangered Species Act of 1971. These Threatened fish species, which are resident and anadromous respectively, are present in a number of the streams in the Analysis area. Additionally spring Chinook salmon a sensitive species, are present in portions of the analysis area.

The Middle Fork John Day River is a tributary of the North Fork John Day River, which is in turn a tributary to the John Day River that flows into the Columbia at river mile 218. There are three dams in the Columbia below the John Day River: the Dalles, Bonneville, and John Day. The mouth of the Middle Fork John Day River is 435 river miles from the Pacific Ocean. There are no dams in the John Day River system.

Cattle grazing has historically and presently contributed to poor riparian vegetation conditions, (see Grazing page 222).

High water temperatures and high sediment delivery rates are stream elements of concern within the Analysis area. Stream temperatures are outside an optimum range for these threatened fish species (c.f., 3.2.2—Stream Temperatures, page 124). Aquatic habitat conditions which contribute to high water temperature are: low sinuosity (a lack of the natural meandering nature in streams), lack of woody debris (lack of wood that naturally falls into streams from a forest canopy that in many sections of streams has been removed from historic railroad logging) and an associated low frequency of pools(pools have in many cases been removed during historic hydraulic mining), bank instability, reduced base flows and a lack of shade. These conditions, collectively, influence the overall water quality, affecting fish dependent on these areas for food, security, and propagation.

Fish Habitat

Over 90% of the fish bearing, or surveyed non-fish bearing, perennial streams do not meet *Land and Resource Management Plan* standards (Amendment 29) for pool frequency—frequencies are about 10-40 % of the expected number based on stream type and size.

Over 90% of the fish bearing or surveyed and non-fish bearing, perennial streams do not meet *Land and Resource Management Plan* standards. (Amendment 29), for large woody debris. Large woody debris is present at about 25-35% of the *Land and Resource Management Plan* standard.

About 60% of streams do not meet *Land and Resource Management Plan* standards (Amendment 29) for shade/canopy closure in forested ecosystems.

The 2001 supplement to the 1999 *Galena Watershed Analysis* suggests that hardwood shrub ecosystems are underrepresented in the analysis area. It is estimated that over 90% of the streams in the analysis area do not meet *Land and Resource Management Plan* standards for shrub ecosystems.

Cool, late season flows are believed to have been reduced due to the impacts of many historical activities such as grazing and logging and recent activities which reduced riparian water storage along 90% of the stream channels by about 50-75%.

Riparian meadows along the privately owned portion of the Middle Fork John Day have been converted to agricultural use, currently cattle grazing. Plant diversity in these meadows have declined since historic times.

Table 93 Endangered, Threatened, and Sensitive Species

Common Name	Scientific Name	Location	Status	Listing Agency
Columbia Basin Bull Trout	*Salvelinus confluentus*	Middle Fork John Day River, Granite Boulder Creek	Threatened	USFWS
Mid-Columbia River Summer-run Steelhead	*Oncorhynchus mykiss*	Middle Fork John Day River, all tributaries in analysis area.	Threatened	NMFS
Interior Redband Trout	*O. mykiss*	Middle Fork John Day River, all tributaries in analysis area.	Sensitive	USFS
Mid-Columbia River Spring Chinook	*O. tshawytsha*	Middle Fork John Day River, all tributaries in analysis area.	Sensitive	USFS
Blue Mountain Cryptochian Caddisfly	*Cryptochia neosa*	Little Boulder, Little Butte, Beaver Creeks	Sensitive	USFS

Bull Trout *Salvelinus confluentus*

Bull trout, are reduced in both numbers and distribution within the analysis area (see Appendix E Map 5—TES Species and Essential Habitat for Fish) and the United States Fish and Wildlife Service (USFWS) has listed this species as threatened under the Endangered Species Act of 1973. Species listed as Threatened or Endangered species, which periodically utilize the analysis area, or their habitats occur within the analysis area are managed after consultation with USFWS scientists. Currently, bull trout are found in Granite Boulder Creek year-round and in the mainstem Middle Fork John Day River during winter and spring. This population is a portion of the Middle Fork John Day River metapopulation. Currently, Granite Boulder Creek has a small resident populations of Bull trout as well as fish which travel into this creek from the mainstem of the Middle Fork of the John Day River and other Creeks, while the other three Creeks are considered "historic" bull trout habitat with no resident population of this species. Oregon Department of Fish and Wildlife (ODF&W) radio telemetry studies show that some bull trout move into the Middle Fork John Day River (as far as 60 miles downstream) and possibly other tributaries when water temperatures begin to cool during late fall. The extent of this activity is currently unknown—but studies are ongoing. Other salmonid species are the primary forage prey for adult bull trout.

Critical habitat and potential recovery areas have not been identified for bull trout. The most likely potential recovery areas within the analysis area are Granite Boulder Creek, Butte, Davis, and Vinegar Creeks. Bull trout currently inhabit Granite Boulder and historically inhabited Butte, Davis and Vinegar Creeks. A single bull trout was found in Vinegar Creek during electro-shocking surveys conducted by ODF&W during a survey in the summer of 2000, and a bull trout was found in Butte Creek in 1996 during snorkel surveys conducted (Hiram Lee, et al 1997) as part of a Chinook salmon study. It is currently unknown if these were isolated populations or just stray fluvial[50] fish.

A report by ODF&W (Unterwegner and Seals 2000) stated that the habitat and temperatures where the bull trout was found in Vinegar Creek were marginal, but that improved watershed management could contribute to increased numbers in this stream. All four streams mentioned above are in need of greater habitat diversity and lower water temperatures during summer and early fall. Fall is critical as this is when bull trout spawning activities occur. There are many reaches identified in Level II

[50] Fluvial: relating to, or inhabiting a river or stream.

Stream surveys having no pool habitat, degraded banks, and very little, if any, shade. There may be other tributaries having potential for bull trout recovery areas. The John Day Basin bull trout technical group is working in identifying criteria and developing recommendations for critical habitat and recovery areas.

Bull trout are a *Land and Resource Management Plan* Management Indicator Species similar to a keystone species. Managing for a keystone species such as bull trout is beneficial to other species as bull trout require the coldest, cleanest water of all listed fish in the projects area. See Appendix E, Map 5—TES Species and Essential Fish Habitat.

Summer-run Steelhead *Oncorhynchus mykiss,*

Steelhead are the anadromous form of the redband trout (see Appendix E, Map 5—TES Species and Essential Habitat for Fish). The National Marine Fisheries Service (NMFS), a federal agency which regulates anadromous fish concerns, has listed this species as threatened under the Endangered Species Act of 1973. Species listed as Threatened or Endangered species, which periodically utilize the analysis area, (or if their habitat occurs within the analysis area) are managed after consultation with NMFS scientists. In the John Day River the steelhead population is Mid-Columbia summer run steelhead. This indicates the time of year when individual fish from this particular stock enter the Columbia River from the ocean. The time of entry into freshwater from the Pacific Ocean to actually spawn in tributaries of the Middle Fork John Day River takes from 10 to 12 months. Individual steelhead are usually present in the Middle Fork and tributaries in April and May. Spawning throughout the John Day River sub-basin occurs shortly thereafter. Optimal location and conditions for a steelhead redd (or spawning bed, which occurs in gravel) include the upper edge of the break between a pool and a riffle where the water has proper velocity, proper flow, proper oxygen, and proper depth to incubate the eggs from this large trout. Redds may contain gravel sizes from pea size up to three inches in diameter and can vary from 8-15 inches in depth. Many adult steelhead return to the ocean after spawning activities are completed.

Young steelhead thrive in moderate gradient streams with high water quality, plenty of shade, hiding cover, and large woody material (LWM). Large wood that naturally falls into streams from a forest canopy is vital in hiding and rearing functions in different portions of the life cycle of fish. Preferred summer water temperatures range from 50-65°F, although rearing steelhead are routinely observed in warmer waters, in apparent good health and vigor. Warmer waters are however preferred by non-game fish species, many of which can be true competitors to steelhead for food and space. Young steelhead move around depending on the level of competition for rearing habitat. Seasonal redistribution of juveniles occurs during spring and fall, as water flows and temperatures change.

After rearing for two to three years, the majority of juvenile steelhead begin migration from their natal streams and start the processes of “smoltification,” or the change in physiological condition necessary for life in a saltwater environment. After leaving the Middle Fork John Day River and making a 435 river mile journey to the Pacific Ocean the John Day summer steelhead spend anywhere from one to three years at sea before making the journey back to their natal streams in the analysis area to spawn.

Adult summer-run steelhead can spawn in the upper-most second and third order tributaries and in larger rivers. There have been no surveys conducted that specifically identify the upper limits of steelhead within the analysis area. Most of the steelhead habitat areas are in need of habitat diversity. The district Level II stream surveys indicate that riffle habitat is the dominant feature in most areas. This condition is caused from factors relating to past activities (see 1.2.1.3 Undesired Condition: Damaged Aquatic Habitat, page 11). Past activities that have removed a diverse habitat of the right components of riparian vegetation, the proper functioning of a pool to riffle ratio, the proper functioning of a width to depth ratio of streams, the absence of large woody debris, and the lack of a

forest canopy that produces shade and large woody debris. Degraded riparian habitat and hydrologic function, is due to activities such as unbuffered timber harvest areas, the removal of beaver, improper grazing practices, poor road locations, and past mining practices. See Appendix E, Map 5—TES Species and Essential Fish Habitat.

Interior Redband Trout *Oncorhynchus mykiss gairdneri*

Interior redband trout are the resident life history form of steelhead. According to Benke (1992), the native populations of redband trout found east of the Cascade Mountains are part of the Columbia River basin sub-species Oncorhynchus mykiss gairdneri (see Appendix E, Map 5—TES Species and Essential Habitat for Fish). This particular sub-species of redband ranges from, and includes, the Columbia River basin east of the Cascades, to barrier falls in the states and provinces of Idaho, Washington, British Columbia, and Alberta. These fish are found in nearly every stream in the Malheur National Forest that is capable of supporting salmonid fish populations and are the most prevalent species of all game fish in the analysis area. Current conditions have, however, been degraded by past land use practices. This condition is caused from factors relating to past activities (see **1.2.1.3 Undesired Condition: Damaged Aquatic** Habitat, page 11). Past activities that have removed a diverse habitat of the proper components of riparian vegetation, the proper functioning of a pool to riffle ratio, the proper functioning of a width to depth ratio of streams, the absence of large woody debris, and the lack of a forest canopy that produces shade and large woody debris. Degraded riparian habitat and hydrologic function, is due to activities such as unbuffered timber harvest areas, the removal of beaver, improper grazing practices, poor road locations, and past mining practices.

Spring Chinook *Oncorhynchus tshawytsha*

Spring Chinook are the only run of salmon in the John Day River system (see Appendix E, Map 5—TES Species and Essential Habitat for Fish). This name is taken from the time of year the adults enter the fresh water of the Columbia River on their spawning migration. The total migration time usually takes them seven to eight months. They arrive in the Middle Fork John Day River sometime in May. Surveys indicate that adult Chinook hold in pools approximately 5 feet deep with escape cover such as undercut banks, fallen trees, or other debris, boulders, or other vegetation nearby. Spring Chinook are considered a Sensitive species on the Malheur National Forest.

Spawning occurs during late August and early September in the Middle Fork John Day River—on both Forest Service and private land. Spawning ground surveys by Oregon Department of Fish and Wildlife (ODF&W) indicate that runs of adult spring Chinook in the John Day River declined from 1974 through 1985. Since that time numbers have been on the increase in the John Day basin with approximately 4,000 spawners returning in 1993. The results of year 2000 spawning surveys in the North Fork and Middle Fork John Day subbasins by ODF&W estimated 5,931 individuals that accounted for approximately 30% of the return. This was the highest return since 1959.

Stream conditions for a good redd site for spring Chinook include the upper edge of a break between a pool and a riffle where the water has proper velocity, flow, oxygen, and depth to incubate salmon eggs. The redd can vary in size from three to six feet in diameter and can be 12-18 inches deep. No hatchery reared spring Chinook have been released into the John Day River basin. Nearly all Chinook salmon die after spawning.

Spring Chinook fry usually emerge from about mid-March through mid-June. Timing is related to differences in water temperature. Distribution of fingerlings in the John Day River sub-basin is most extensive in late spring/early summer. Chinook fingerling distribution moves upstream and into tributaries as water temperatures increase. Young Chinook thrive in low gradient streams with high water quality and tend to school and feed in side pockets, channels, beaver ponds, and areas where dead and dying organic material, aquatic insects, and drift accumulate. The young Chinook salmon

move around depending on the level of competition for rearing habitat, water flow and temperature, and availability of food. Surveys have indicated that water temperatures appear to limit the distribution of fingerling Chinook in the Middle Fork John Day system. However, stock-recruitment analysis suggests that instream habitat is presently under seeded due to losses of migrating smolts and adults at the John Day, The Dalles, and Bonneville Dams.

Most Chinook spawning occurs in the mainstem on both private and National Forest land. The Malheur National Forest has few records of Chinook spawning in tributaries, except an adult pair found in Vinegar Creek during a stream survey in August 1991. As noted above, juveniles move up the tributaries as water temperatures in the main river warm up during summer conditions. However, they are usually found in the lower reaches of tributaries. The juveniles can rear in fresh water for up to two years prior to smolting and moving into the Pacific Ocean. Most of the juvenile Chinook habitat areas in the analysis area is in need of habitat diversity. The district Level II stream surveys indicate that riffle habitat is the dominant form of habitat in most areas. This condition is caused from factors relating to past activities (see 1.2.1.3 Undesired Condition: Damaged Aquatic Habitat, page 11). Past activities that have removed a diverse habitat of the proper components of riparian vegetation, the proper functioning of a pool to riffle ratio, the proper functioning of a width to depth ratio of streams, the absence of large woody debris, and the lack of a forest canopy that produces shade and large woody debris. Degraded riparian habitat and hydrologic function, is due to activities such as unbuffered timber harvest areas, the removal of beaver, improper grazing practices, poor road locations, and past mining practices.

The Pacific Fisheries Management Council designated Chinook salmon be managed under Public Law 104-267, the Sustainable Fisheries Act of 1996. This amended the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act). Section 305(b) of the Magnuson-Stevens Act (16 U.S.C. 1855(b)) for Essential Fish Habitat (EFH) is described as those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity in order to support a long-term sustainable fishery (Magnuson-Stevens Act Section 3). This law requires Federal agencies to consult with NMFS on activities that may adversely affect EFH. See Appendix E, Map 5—TES Species and Essential Fish Habitat.

Blue Mountain Cryptochian Caddisfly *Cryptochia neosa*

Larval stages of this invertebrate were identified throughout Granite Boulder Creek and in three tributaries of Little Boulder, Little Butte, and Beaver Creeks. This is one of seven species confined to montane streams of western North America. Few records exist for five of the seven, which include *C. neosa* that are located in northeastern Oregon and southeastern Washington. From a report written by Betts and Wisseman (1995), only one record of *C. neosa*, collected June 21, 1952 on Lunch Creek near Prairie City, Oregon and is published. Several unpublished records have been made since that time however. This species is classified as a Regional Category 2 invertebrate in 1984. Category 2 species included in the Regional Forester's (Region 6) list of sensitive species are to receive special management emphasis on all public lands administered by the USDA Forest Service in order to ensure their viability and to preclude trends toward endangerment that would result in the need for Federal listing (FSM 2672.1). The authors of this paper concluded the *C. neosa* is the only species of *Cryptochia* present in the Blue Mountains. These invertebrates are normally found in low order, high gradient stream containing sediment free, woody debris or bark.

Riparian Habitat

Riparian areas are used disproportionately to their occurrence by many terrestrial wildlife species, and some species are dependent upon these areas. Terrestrial species of concern in the watershed that associate strongly with riparian habitat are listed in the following table. For the location of

Riparian Habitat Conservation Areas see Appendix E, Map 3—Management Areas and Roadless Areas.

Analysis Area Stream Overview

The following table lists all streams in the analysis area and includes the total number of fish bearing miles (Category 1), perennial non fish bearing (Category 2) and intermittent (Category 4) channels.

Table 94 Streams by miles

Category or Class	Middle Fork John Day River	Davis Placer Gulch	Vinegar	Vincent	Deerhorn Little Boulder	Little Butte Tincup	Butte	Granite Boulder
Class 1 Fish Bearing	9.50	12.69	11.15	5.25	14.17	12.43	6.66	8.07
Class 2 Perennial	n/a	10.62	10.39	3.14	16.53	12.42	7.06	12.24
Class 4 Intermittent	n/a	11.67	25.33	9.12	28.76	14.90	10.22	8.54
Class 5 Mapped Ephemeral Draws	n/a	3.09	6.08	2.02	6.53	6.55	4.35	2.89

Middle Fork John Day River

Adult Chinook salmon and steelhead to a lesser degree (due to large substrate) utilize this section of the Middle Fork John Day River for spawning activities. Juvenile rearing takes place in this section, mostly near cold water inputs from tributary streams and springs because water temperatures are high. It is likely that juveniles are utilizing the lower portions of tributaries as temperatures become elevated in the mainstem. Fluvial bull trout use this section of the Middle Fork John Day River as migratory habitat in late winter and spring while traveling from lower sections of the mainstem to smaller tributaries for summer rearing and spawning activities. Adult, fluvial bull trout have been found upstream to Phipps Meadows within the past

Nongame fish such as northern pikeminnow (*Ptychocheilus oregonensis*), mountain whitefish (*Prosopium williamsoni*), suckers (Catostomus spp.), speckled dace (*Rhinichthys osculus*), longnose dace (*Rhinichthys cataractae),* redside shiner (*Richardsonius balteatus*), and sculpin (*Cottus spp.*) as well as pacific lamprey (amocoetes form—*Lampetra* spp.) are found in this section of the Middle Fork John Day River.

Oregon Department of Fish and Wildlife (ODFW) personnel have completed habitat surveys in 1992 and 1996. Stream temperatures ranged from 52-70°F in August and September. Pools frequency ranged from 1.72 to 5.80 per mile. Pool spacing ranged from 9 channel widths distance in Reach 10 to 28.5 in Reach 9. Pools greater than 3 feet deep ranged from 0.13 to 2.28 per mile. Unstable banks ranged from 10% to 32%. Wetted width to depth ranged from 42.2 to 49.8. Shade ranged from 18 to 42%. Large woody debris ranged from 3.2-9.6 per mile. All wood present was movable at peak or near peak flows. . For the location of Riparian Habitat Conservation Areas see Appendix E, Map 3—Management Areas and Roadless Areas; see also Map 1—Subwatersheds and Topography;and Map 5—TES Species and Essential Fish Habitat.

Level II Stream Survey Results

Vinegar Creek

1991 LEVEL II STREAM SURVEY RESULTS

Adult and juvenile redband trout inhabit the lower 5.5 miles of Vinegar Creek. Juvenile steelhead and juvenile Chinook possibly inhabit the same stream habitats. This stream had historic bull trout inhabiting before 1991. August stream temperatures obtained from hand held thermometers ranged from 42° to 72°F. The difference in stream temperatures was observed from the lower (higher temps) to the upper reaches (lower temps). Instream woody debris counts of pieces >12″ dbh ranged from 0 /mile in Reach 1 to 243/mile in Reach 12. Stream sediment was excessive in all reaches. Pools/mile ranged from 0 in Reach 17 to 36 in Reach 10.

2000 HABITAT SURVEY RESULTS

Fisheries personnel conducted a habitat stream survey on the first 4 miles from the mouth in 2000. Results of the survey showed this stream channel is in active recovery on portions with low gradients and wide valley bottoms (expected Rosgen “C” or “E” channel types). Sometime in the past, the stream had down cut 2-3 feet and formed a Rosgen “B” channel type within the old channel. Currently, stream sinuosity is increasing and stream gradient is decreasing. Width to depth ratios are improving but are still high relative to expected for the geomorphology of the stream reaches. Quantity and quality of pool habitat is currently increasing but is not at optimum levels. Some areas are actively cutting new channels where the current channel was entrenched by 2-3 feet. Floodplains are reconnecting and water tables rising in these sections. Shade from deciduous trees and shrubs was still inadequate to maintain temperatures for resident and anadromous fish.

ODF&W BIOLOGICAL Surveys

Oregon Department of Fish and Wildlife detected an individual adult bull trout in Vinegar Creek during electro-shocking surveys completed in 2000. It is currently unknown if there is a population of bull trout in this stream, or if this was a stray or foraging fluvial adult, which may have traveled into Vinegar Creek from another area, or if there are small disjunct population of this species. Populations of threatened steelhead, sensitive redband trout, and sensitive Chinook salmon are also found in this stream.

Currently, Granite Boulder Creek has a small resident populations of Bull trout as well as fish which travel into this creek from the mainstem of the Middle Fork of the John Day River and other Creeks, while the other three Creeks are considered “historic” bull trout habitat with no resident population of this species. However, recent ODFW electro-shocking surveys detected an individual adult bull trout in Vinegar Creek. An individual bull trout was observed during snorkeling surveys in Butte Creek (McIntosh 1995). It is unknown at this time if these fish were stray fluvial adults, which have traveled into Vinegar Creek from another area, or if there are small disjunct populations. Populations of threatened steelhead, sensitive redband trout, and sensitive Chinook salmon are also found in these streams.

Butte Creek

1992 LEVEL II STREAM SURVEY RESULTS

An individual bull trout was observed during snorkeling surveys in Butte Creek (McIntosh 1995). Adult and juvenile redband trout inhabit the lower 4.0 miles of mainstem Butte Creek, the lower 1.5 miles of Sulphur Creek, and the lower 0.5 miles of Bennett Creek. Juvenile steelhead and juvenile Chinook possibly inhabit the same stream habitats. This is also a historic bull trout stream (inhabited prior to 1990). The mainstem showed July stream temperatures obtained from hand held thermometers ranging from 46° to 57°F, instream woody debris counts of pieces >12″ dbh ranged

from 63.1 /mile in Reach 1 to 84.3/mile in Reach 3, stream sediment was excessive in the lowest two reaches and <35% embedded in Reach 3, and pools/mile ranged from 23.0 in Reach 1 to 37.5 in Reach 2.

2000 HABITAT SURVEY

Fisheries personnel conducted additional stream surveys on the first 3.5 miles from the mouth in 2000. Results of the survey showed width to depth ratios are high relative to expected for the geomorphology of the stream reaches. Quantity and quality of pool habitat is still below optimum levels. Most log weir structures created in the 1980s are not creating pools and in many cases are widening stream channels and creating barriers for juvenile fish at low flows. Shade from deciduous trees and shrubs is still inadequate to maintain temperatures for resident and anadromous fish.

Ragged Creek

1991 LEVEL II STREAM SURVEY RESULTS

Adult and juvenile redband trout inhabit the lower 3.0 miles of Ragged Creek. Juvenile steelhead and juvenile Chinook possibly inhabit the same stream habitats. July stream temperatures obtained from hand held thermometers ranged from 50° to 68°F. Instream woody debris counts of pieces >12″ dbh ranged from 26.6 /mile in Reach 1 to 14.8/mile in Reach 3. Stream sediment was excessive in all reaches. Pools/mile ranged from 154.3 in Reach 2 to 70.7 in Reach 3.

Vincent Creek

1991 LEVEL II STREAM SURVEY RESULTS

Adult and juvenile redband trout inhabit the lower 5.0 miles of Vincent Creek. Juvenile steelhead and juvenile Chinook possibly inhabit the same stream habitats. July stream temperatures obtained from hand held thermometers ranged from 54° to 70°F. Instream woody debris counts of pieces >12″ dbh ranged from 0.0 /mile in Reach 1 to 91.6/mile in Reach 3. Reach 1 was a livestock pasture. Stream sediment was excessive in all reaches. Pools/mile ranged from 45 in Reach 1 to 96.6 in Reach 2. Vincent Creek stream survey listed several areas of habitat degradation caused from mining activities.

Granite Boulder Creek

1993 LEVEL II STREAM SURVEY RESULTS

Adult and juvenile redband trout inhabit the lower 4.0 miles up to a barrier falls in Granite Boulder Creek. Juvenile steelhead inhabit the same stream habitats. Bull trout (both resident and fluvial life history forms) were found in the lower 4 miles. Chinook salmon were found in the lower mile of this stream. August stream temperatures obtained from hand held thermometers ranged from 48° to 59°F. Instream woody debris counts of pieces >12″ dbh ranged from 13 /mile in Reach 1 to 33.4/mile in Reach 3. Cobble embeddedness and stream shade did not meet *Land and Resource Management Plan* Standards in reaches 1-3 (reaches 1-2 are fish bearing). Pools/mile ranged from 26 in Reach 1 to 39 in Reach 2. Sparse populations of Blue Mountain cryptochian were found in all reaches.

2000 HABITAT SURVEY

Fisheries personnel conducted additional stream surveys on the first 4.0 miles from the private land boundary in 2000. Results of the survey showed width to depth ratios are high relative to expected for the geomorphology of the stream reaches. Quantity and quality of pool habitat is still below optimum levels. Most log weir structures created in the 1980s are not creating pools and in many cases are widening stream channels and creating barriers for juvenile fish at low flows. Shade from

deciduous trees and shrubs is still inadequate to maintain temperatures for resident and anadromous fish. (Also, see Beaver Activity, page 135.)

Caribou Creek

1993 LEVEL II STREAM SURVEY RESULTS

Adult and juvenile redband trout inhabit the lower 2.0 miles of Caribou Creek. Juvenile steelhead and juvenile Chinook possibly inhabit the same stream habitats. June stream temperatures obtained from hand held thermometers ranged from 49° to 74°F. Instream woody debris counts of pieces >12″ dbh ranged from 23.6 /mile in Reach 1 to 39.8/mile in Reach 2. Stream sediment was excessive in all reaches. Pools/mile ranged from 58 in Reach 1 to 35 in Reach 2.

Deerhorn Creek

1993 LEVEL II STREAM SURVEY RESULTS

Adult and juvenile redband trout inhabit the lower 2 miles of Deerhorn Creek. Juvenile steelhead and juvenile Chinook possibly inhabit the same stream habitats. June stream temperatures obtained from hand held thermometers ranged from 49° to 59°F. Instream woody debris counts of pieces >12″ dbh ranged from 14.3 /mile in Reach 1 to 125.7/mile in Reach 2. Stream sediment was excessive in all reaches. Pools/mile ranged from 28 in Reach 1 to 54 in Reach 2.

Little Boulder Creek

1993 LEVEL II STREAM SURVEY RESULTS

Adult and juvenile redband trout inhabit the lower 2.5 miles of mainstem Little Boulder Creek and the lower 0.5 miles of Tributary 2. Juvenile steelhead and juvenile Chinook possibly inhabit the same stream habitats. June stream temperatures obtained from hand held thermometers ranged from 45° to 55°F. Instream woody debris counts of pieces >12″ dbh ranged from 23.1 /mile in Reach 1 to 54.3/mile in Reach 2. Stream sediment was excessive in all reaches. Pools/mile ranged from 22.5 in Reach 1 to 27.6 in Reach 2. The Blue Mountain caddisfly was also present in this tributary. Tributary 2 had redband inhabiting the lower 0.5 mile of stream. Natural falls and lack of water from this point upstream prevented fish from inhabiting this reach of stream. Blue Mountain caddisfly was not present in this tributary.

Little Butte Creek

1993 LEVEL II STREAM SURVEY RESULTS

Adult and juvenile redband trout inhabit the lower 1.0 mile of mainstem Little Butte Creek and the lower 1.0 mile of Tributary 2. Juvenile steelhead and juvenile Chinook possibly inhabit the same stream habitats. Mainstem June stream temperatures obtained from hand held thermometers ranged from 48° to 65°F. Mainstem instream woody debris counts of pieces >12″ dbh ranged from 33.2/mile in Reach 1 to 61.6/mile in Reach 2. Stream sediment was not excessive in both reaches of the mainstem. Pools/mile ranged from 33 in Reach 1 to 15 in Reach 2. Tributary 2 June stream temperatures obtained from hand held thermometers ranged from 46° to 65°F. Tributary 2 instream woody debris counts of pieces >12″ dbh ranged from 28.1/mile in Reach 1 to 37.6/mile in Reach 2. Stream sediment was excessive in both reaches of the Tributary 2. Pools/mile ranged from 34 in Reach 1 to 32 in Reach 2. The Blue Mountain caddisfly was also present in this tributary.

Davis Creek

1996 STREAM SURVEY RESULTS

Adult and juvenile redband trout inhabit the lower 5.0 miles of Davis Creek. Juvenile steelhead and juvenile Chinook possibly inhabit the same stream habitats. July stream temperatures obtained from hand held thermometers ranged from 48° to 71°F. Instream woody debris counts of pieces >12″ dbh ranged from 29.6 /mile in Reach 2 to 81.0/mile in Reach 4.

2000 HABITAT SURVEYS

Fisheries personnel conducted additional stream surveys in 2000 on the first 3.5 miles from the mouth to a cascade that is a fish barrier. Results of the survey showed quantity and quality of pool habitat is currently increasing but is not at optimum levels. Shade from deciduous trees and shrubs is still inadequate to maintain temperatures for resident and anadromous fish in the lower portion. (Also, see Beaver Activity, page 135.)

Placer Gulch

1997 STREAM SURVEY RESULTS

Adult and juvenile redband trout inhabit the lower 3.2 miles of Placer Gulch Creek. Juvenile steelhead and juvenile Chinook possibly inhabit the same stream habitats. August stream temperatures obtained from hand held thermometers ranged from 48° to 74°F. Instream woody debris counts of pieces >12″ dbh ranged from 0 /mile in Reach 1 to 56.2/mile in Reach 5. Pools/mile ranged from 0 in Reach 1 to 56.5 in Reach 3.

Fish Habitat

Pool habitat is created by areas of high water velocity during peak flows that become depositional areas during low flows (Chamberlin et al., 1991). This habitat is important for all life stages of salmonids as pools during summer when this habitat is important as a slow water sanctuary and temperatures in the deeper section of pools tend to be lower than ambient stream temperatures. Pools are also important for winter rearing habitat when fish move into the interstitial spaces of gravels. Timber harvest activities can increase the supply of fine sediments, which settle in pools and reduce usefulness as fish habitat.

Riffle habitats are locations of sediment deposits with water flowing over them that contain larger substrate such as gravels, cobbles and boulders. These sections produce food for fish but offer few habitats to small fish (Chamberlin et al., 1991). Timber harvest can increase sediment supplies and increase the amount of riffle habitat in streams.

Beaver Activity

A few beaver reside in the analysis area. Formerly, these animals were thought to have been removed from the watershed by trapping. Beaver sign has been recently found in some portions of the headwaters of Davis Creek and Granite Boulder Creek, upstream of Forest Road 4550. Evidence of beaver activity also exists along the Middle Fork John Day River.

Beaver play a crucial role in the maintenance of stream channels and associated RHCAs in the dry, high desert habitat of central Oregon (Lichatowich 1999). Beaver dams raise water tables and connect stream channels with flood plains. Higher water tables allow water to be stored longer and released later in the year increasing base flows. This aids in creating and maintaining riparian vegetation that maintains cooler water temperatures by providing stream shade and eventually recruits instream Large Woody Debris when vegetation falls into the stream channel. Beaver dams

also create hydrologic control structures that trap sediment and buffer the effects of natural disturbances such as floods and droughts.

Beaver activity creates deep pool habitat, which provides excellent summer and winter rearing habitat for salmonids. Beaver dams can create barriers to upstream movement of fish but this is uncommon and tends to only deter migration for a few years at most.

Disturbance Regimes In Aquatic Habitat

Recreation Affects in RHCAs

Field observations have identified a number of dispersed campsites (see page 89) and trail systems located within Riparian Conservation Areas (RHCAs) that are affecting soils through compaction and displacement. This activity is delivering sediment to nearby streams. A recent trend of cross-country use of All Terrain Vehicles (ATV) is causing resource damage. These situations are potentially degrading water quality in the analysis area. Many factors and complex physical hydrologic processes relate to the risk of sediment from activities that occur in the analysis area. These include: the total level of activity relative to stream channels; peak water flows; and erosion hazard and other soil characteristics of the lands being utilized; the manner of utilization and the extent and magnitude of past activity which may have created unstable conditions.

Middle Fork Dispersed Sites

Camping near the Middle Fork John Day River has caused impacts along the river's edge. In these Middle Fork areas camping is affecting soils through compaction and displacement. This activity is delivering sediment to the Middle Fork of the John Day River.

Murdock Dispersed Site

Dispersed site in the Tincup/Little Butte Creek SWS (historically known as Murdock) has an access road with native surface and is deeply rutted in places and widened in areas where users have driven around these ruts. Soil compaction and loss of vegetation has occurred. The access road and dispersed camp sites are within 100 feet of Middle Fork of the John Day River (see Appendix E, Map31—Recommended Trails, Trailheads, and Campsite Projects-for Action Alternatives).

Deerhorn Forest Camp (Campground)

The Deerhorn Forest Camp (Campground), in Little Boulder/Deerhorn SWS, access to this area is rutting and has severe potholes, the camp sites are scattered, and foot access to the river is not controlled. Consequently, vegetation is being trampled and compacted due to this uncontrolled use (see Appendix E, Map31—Recommended Trails, Trailheads, and Campsite Projects-for Action Alternatives).

Davis Creek Trail

All Terrain Vehicles (ATV) currently use the Davis Creek Trail with current use rated as high and increasing. Due to inadequate trail width because the trail was originally designed as a motorcycle trail (trail bikes were popular at the time of design) the current use may not be safe. This safety concern is because the original design conflicts with a change in the use pattern throughout the entire length of this trail and currently does not meet Forest Service trail guide specifications for ATV use. The entire trail length of 11.8 miles is less than standard width and would require major reconstruction to meet the guides for ATV use. The Davis Creek Trail fords Butte Creek three times and has water quality and possible fish concerns at each of these crossings due to ATV use.

Resource damage is occurring in other stream crossings along segments of the trail and at the inadequate bridge crossings which were originally designed for Motorcycle (trail bike) use.

Grazing

Excessive livestock grazing from past management practices earlier in the past century, on-going grazing from present allotments, and heavy browsing by deer and elk have contributed to a reduction in riparian vegetation and upland vegetation composition. These factors have caused a reduction of native shrubs, forbs, and grasses. Losses within the Riparian Habitat Conservation Areas (RHCAs) have reduced the stream shading that helps to maintain low water temperatures. Changes in upland shrub and ground cover have decreased moisture and soil-holding capacity on some portions of the landscape—consequently this has decreased water storage capacity for late season flows.

As a result, the increased speed with which water leaves the landscape and the amount of water delivery to stream channels contribute to the primary concern of decreased late season water flows. This condition has contributed to excessive stream entrenchment prevalent in the Southeast Galena Analysis area.

Both livestock and wild ungulate (deer and elk) grazing has had a major influence on the watershed. Cattle grazing occurs in all subwatersheds within the analysis area.

Livestock concentration due to salting in conjunction with Forest Road 2010-159 is contributing to erosion in an unnamed intermittent stream in Little Boulder Creek subwatershed. Livestock concentration may also be partially responsible for the erosion of stream bank along sections of the mainstem Middle Fork John Day River surveyed by the Oregon Department of Fish and Wildlife. This erosion may also be attributed to increased peak flows entering the mainstem from flashier upstream watersheds.

Grazing impacts within riparian zones have been reduced because of modified management strategies due to the Endangered Species Act. There are several relatively small meadows in the watershed, which provide good forage for ungulates. Most of these are in fair to good rangeland condition. The species composition of many of these meadows has changed from native to non-native plants. Kentucky bluegrass, timothy, orchard grass, intermediate wheat grass and dandelions dominate many of the meadows. There is one exception to this scenario. Privately owned pastures along the upper part of the Middle Fork John Day River, from the town of Bates to Caribou Creek are dominate by tufted-hairgrass which is a native species. These meadows produce an abundance of vegetation, most of which are not being utilized by foraging animals.

A debris torrent occurred in Lemon Creek (a tributary of Granite Boulder Creek). This torrent is believed to have originated from areas eroded 100 years ago following heavy sheep grazing. The debris torrent was triggered by a locally concentrated rainfall event.

Access Travel Management

Roads in uplands outside of RHCAs can impact watersheds and fish habitat but effects are much more subtle in the landscape of the analysis area. Increasing the drainage network and reducing the time water takes to reach live water on the landscape are 2 examples of potential impacts.

Road impacts within RHCAs are especially evident in the subwatersheds of the Southeast Galena Restoration Analysis area. Both closed and open roads located in RHCAs have numerous impacts to riparian and stream function. They commonly constrict flood plains which increases stream energy during high flows. This can increase sediment transport, bank scour and channel down cutting, all of which degrade fish habitat. Roads in RHCAs also contribute chronic sediment input to streams, reduce stream sinuosity, increase stream gradient, reduce stream shade and reduce overall floodplain function. These changes can reduce fish habitat quantity and quality. See

Appendix E, Map 3—Management Areas and Roadless Areas for a view of RHCAs and Map 29—Access Travel Management Plan Alternatives 2, 3, and 4 for current open and closed roads.

The following table shows the total RHCA road miles within each subwatershed of the analysis area. The open asphalt miles include portions of County Road 20.

Table 95 Total RHCA road miles

Road Status	Surface Type	Davis Placer	Vinegar	Vincent	Deerhorn Little Boulder	Little Butte Tincup	Butte	Granite Boulder
Open	Asphalt	1.43	0.11	0.09	2.12	3.07	0.07	0.0
Closed	Asphalt	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Open	Aggregate	0.0	1.05	1.42	0.0	1.25	0.29	2.04
Closed	Aggregate	0.0	1.30	0.21	0.0	0.0	0.68	0.18
Open	Improved	0.0	0.0	0.0	0.96	0.0	0.0	0.63
Closed	Improved	0.0	0.18	0.0	0.22	0.04	1.13	1.68
Open	Native	2.13	0.57	0.0	0.0	0.0	0.0	0.25
Closed	Native	6.24	5.49	5.34	6.88	3.02	3.40	3.78
Percent Road Miles in RHCA♠		22	21	23	24	22	21	24
Total All Roads		9.8	8.70	7.06	10.18	7.38	5.57	8.56
Total Open Roads		3.56	1.73	1.51	3.08	4.32	0.36	2.92
Source: Blue Mountain RD GIS, March 1999								

In 2001 the Malheur National Forest initiated a Forest-wide evaluation of road crossing sites on fish bearing streams to determine where structures exist that could present barriers to fish passage. This includes any water flow level any life stage of the fish. The table below indicates the results for all of the existing crossings evaluated in the analysis area. Data from some culvert surveys were inconclusive and are listed as "Unknown Status" in the table.). At least 25% of these culverts are not designed to handle a 100-year flood event. It is also estimated that as many as 85% of the culverts on fish bearing streams pose a barrier to some life stage of fish migration.

Existing culverts on fish bearing streams

SWS NAME	Total Culvert Crossings on Fish Bearing Streams	Passable to All Life Stages of Fish at All Flows	Unknown Status	Not Passable to all Life Stage of Fish at Some Flow
Davis/Placer Gulch	1			1
Vinegar	7	1	1	5
Vincent	4	1		3
L. Boulder/Deerhorn	4	1	1	2
Tincup/L. Butte	8		2	6
Butte	3	1		2
Granite Boulder	4			4
TOTAL	31	4	4	23

Recreation Interface with Aquatic Habitat

Road development, including those constructed for timber harvesting, have provided increased access for hunting, fishing, hiking, dispersed and developed site camping, and other recreational activities to the watershed in the last 50 years or more. Recreation use is gradually increasing to include year-round activities such as snowmobiling, cross-country skiing, summer camping, and mountain bike riding. Beginning in the middle of May and continuing through November, established campgrounds and stream areas along the Middle Fork John Day River receive continuous moderate to heavy use. Deer and elk hunting are very popular recreation activities within much of the Southeast Galena Restoration analysis area.

There are two Forest Service developed recreation facilities within the analysis area along the mainstem Middle Fork John Day River: The Middle Fork and Deerhorn campgrounds (see page 228). The Middle Fork campground is a fee campground, the Deerhorn campground is not. This has created additional use in the non-fee campground (which users prefer) that occurs throughout the recreational season. Because of this, the non-fee campground receives disproportionate use and impacts, which the fee campground does not.

There are dispersed campsites located within the analysis area that have impacts to aquatic habitat. Use of these sites varies throughout the year, with the majority of sites showing heaviest use during the fall hunting season. This is also the critical time of year for fall spawning of bull trout and Chinook salmon. Dispersed campsites are characterized by primitive structures such as toilets, meat poles, fire rings, and benches built by campers. Campsites are concentrated primarily in flat areas off main transportation systems where water can be accessed. Many are near springs or creeks. Varied degrees of vegetation and riparian zone damage occurs throughout the watershed due to vehicles, sanitation practices, and removal of vegetation for various purposes. In some areas, road closures have been implemented to relocate camping towards the use of developed campgrounds, forest camps, and other dispersed sites.

*(See also **1.2.1.3 Undesired Condition: Damaged Aquatic** Habitat, page 11 **ISSUE 1.4.1—Restricted Access**, pages 30, and 327 ; **ISSUE 1.4.2—Effects of All Terrain** Vehicle (ATV) use, page 31; page 31; **ISSUE 1.4.4—Effects of Heavy Equipment** in RHCAs, page 31; and **ISSUE 1.4.7—Blow down in Vincent/Vinegar** RHCAs, page 32. See also Appendix E, Map 1—Subwatersheds and Topography; Map 5—TES Species and Essential Fish Habitat; Map 31—Recommended Trails, Trailheads, and Campsite Projects—For Action Alternatives, for existing trails and campsites.)*

3.2.4 VEGETATION BY FOREST TYPE

Forest types are descriptive terms being used to group vegetation by similar moisture and temperature environments which result in similar fire regimes. Forest types are also referred to as Biophysical Environments (BEs) or Potential Vegetation Groups (PVGs). This document will use the term Forest types, but the reader should be mindful that Biophysical Environments and Potential Vegetation Groups are terms used interchangeably in resource science.

This document, (Galena WA, Supplement—2002) classifies vegetation groups into the following five Forest types (see also Appendix E, Map 6—Forest Stand Types and Map 7—Forest Stand Structural Stages)

Dry Forest Type: Occupy low to mid elevations and south slopes at higher elevations. Stands are composed of ponderosa pine, Douglas-fir, lodgepole, grand fir, and western larch. Under optimum conditions the fire regime is of a low intensity and high frequency (10-15 years) over most of the area, with small patches of mortality . Dry Forest comprise about 29,000 acres or 59% of the Southeast Galena area. See 3.2.4.1 Dry Forest , page 140.

Moist Forest Type: Occupy mid elevations, northerly aspects and cooler, wetter draw bottoms. Stands are composed of ponderosa pine, Douglas-fir, grand fir, lodgepole pine, western white pine, western larch, and Englemann spruce. Under optimum conditions the Moist Forest fire regime is mixed, with low intensity, high frequency (10-15 years) regime overlaid with a high intensity, low frequency (100-200 years) regime. Patch size for disturbance by fire for this group would under optimum conditions range from 200 to 2,000 acres. Dry Forest group comprise about 11,500 acres or 23% of the Southeast Galena area. See3.2.4.2 Moist Forest Type, page 147.

Lodgepole Forest Type: Occupy a wide range of forest types, usually maintained by fire or frost pockets. Stands are composed of lodgepole pine, often in almost pure stands, with western larch and later grand fir and other shade tolerant species. Fire regime in this group is high intensity, moderate frequency (80-120 years). These areas comprise about 1500 acres (2% of the Southeast Galena area). See 3.2.4.3 Lodgepole Pine Forest Type, page 151.

Cold Forest Type: Occupy high elevation sites, northerly aspects, and cooler, wetter draw bottoms. Stands are composed of Englemann spruce, sub-alpine fir, white bark pine, and lodgepole pine and the fire regime in this group is high intensity, low frequency (50-275+ years) with noticeable susceptibility to torching and crown fires. Cold Forests occupy approximately 2,000 acres (or 4% of the Southeast Galena area). See 3.2.4.4 Cold Forest Type, page 154.

Woodland Type: Occupy dry sites at low to mid elevations, often on south slopes. Stands are historically open ponderosa pine savannahs and with a sparse intermingling of juniper that was maintained historically by frequent fires. Woodlands occupy approximately 1,400 acres (3% of the SE Galena area). See 3.2.4.5 Woodland Forest Type, page 157.

These groups and others (see 3.2.4.6 Other Vegetation, page 158) interact together and overlap ecosystems in the analysis area in a complex range that historically formed fire-adapted forests.

3.2.4.1 Dry Forest Type

Photo 13—Old Forest Single Strata (OFSS) which comprised 30-50% of the analysis area in Dry Forest types is now only 1% (see Table 96 and also Appendix E, Map 7—Forest Stand Structural Stages).

Dry Forests occupy approximately 29,000 acres (59% of the Southeast Galena area). They occur across a range of soils (volcanic ash as well as mixed and residual soils—gravely to cobbly loams, clay loams) and southerly to flat aspects along mid to lower elevations.

Dry Forests are represented by an array of plant associations, indicating the wide range of environments they occupy. Species compositions in Dry Forests range from nearly pure ponderosa pine to mixes of ponderosa pine, Douglas-fir, grand fir, western larch, and lodgepole pine.

In some locations juniper is increasing its range into the Dry Forests in the absence of frequent ground

fires. Also, ponderosa pine is encroaching into meadows that historically were kept free of trees by frequent fire occurrences.

Understory Plants

The alteration of natural fire regimes has resulted in uncharacteristically dense shade from the overstory where late seral species such as Douglas-fir and grand fir are heavily stocked. The shade has altered the understory vegetation and decreased ground cover. Native understory grasses, forbs, and shrubs that are adapted to short fire-return intervals and the high light availability of open, Dry Forest environments, are not as numerous, nor as vigorous as they were in the past. Low intensity burns no longer stimulate common species such as pine grass, blue wild rye, and bitterbrush.

Dry Forest has generally sustained the heaviest use of its understory, and therefore is the most changed from its historic condition. The combination of loss of regular fires, heavy use by cattle for the last 80 to 100 years, and current large populations of wild ungulates (deer and elk) has resulted in severe degradation of the upland shrub component. Native grass and forb species, while still predominating, are widely mixed with exotic species introduced to enhance grazing and/or stabilize soils along roads, skid trails, and landing sites. Some of these same disturbed locations now host populations of noxious weeds (see page 203). Riparian areas have suffered similar losses of streamside shrubs, and exotic grasses such as Kentucky bluegrass (*Poa pratensis*) have largely replaced native species where water tables have dropped. Historic beaver wetlands with species-rich habitats are virtually non-existent, while placer tailings along some streams such as Vinegar and Vincent Creeks provide substrates that support minimal vegetation, much of it exotic.

Disturbance Processes—Dry Forest Type

Dry Forests have been affected by a variety of disturbances. These include: insects; diseases; fire; and human related disturbances such as timber harvest, fire suppression, and grazing. Fire is by far the major disturbance agent in Dry Forests. Other disturbance agents in this forest type include a variety of insects and diseases. In general, these disturbance agents added to the structural diversity of these stands by providing small areas/openings for understory vegetation to establish.

FIRE

Historic fire disturbance regimes in these forest environments can be best characterized as high frequency/low intensity. Fires started by lightning burned in the form of under burns and small areas of lethal fires on a frequency of every 10-35 years in these forest types (Agee 1993, Hall 1977). Before the advent of Euro-American settlement, cultural fire or “Indian burning,” probably supplemented natural fire regimes (Rotell 2001). These fires were agents of stability, helping to maintain stands with high proportions of fire tolerant species and large areas of relatively open park like conditions. Small areas of denser forest patches occurred in areas missed or more resistant to fire (draws, spring seep areas, wetter aspects).

Recent fires however, have been large, stand replacement events that are very out of character with the historical fires that occurred. The Summit Fire is the most recent in the Galena watershed and covered 30,000 acres, of which over half was in the Dry Forest Type. The Summit Fire burned as an uncharacteristically severe wildfire across 75% of the area at an intensity and magnitude much greater than the mostly low intensity historical fires.

INSECTS

The western pine beetle was the primary bark beetle working in the stands historically dominated by larger diameter ponderosa pine. Scattered individual tree mortality created small openings in stands where pockets of understory could establish. Mountain pine beetle and pine engraver were likely

present at low levels due to the overall lack of suitable habitat (i.e. dense thickets of smaller diameter trees).

Bark beetles are the most common insects present in the Dry Forests. Denser stands with a high proportion of sapling to pole sized ponderosa pine have increased levels of mountain pine beetle and Ips beetle activity and associated mortality. Western pine beetle is also present across Dry Forests, keying in on highly stressed larger overstory ponderosa pine. Fir engraver activity is prevalent in Dry Forests due to the combination of high stand densities and increased proportion of grand fir occupying these sites. At endemic levels, these forest insects play an important role in contributing to structural diversity, and providing dead wood habitat important for wildlife and soil productivity. At epidemic levels, they create conditions that can lead to disturbance intensities outside the historic range.

> Epidemic insect or pathogen populations can overcome the defenses of relatively healthy trees. In other words, when outbreaks develop on landscapes populated primarily by stressed trees, even trees growing under favorable conditions are exposed to tree-killing numbers of insects or pathogens. For this reason, budworm and bark beetle outbreaks generated by stressed understory firs on upland sites spread to firs in riparian and high elevation forests and kill trees that would otherwise been resistant to insects and diseases. (Johnson, et al, 1995).

Impacts of the recent (1985-1992) spruce budworm outbreak are found in the moister vegetation types within the Dry Forest group, especially in the multi-strata stand structures. In general, the suppressed tree classes of grand fir, Douglas-fir, and Englemann spruce exhibit poor crowns, reduced growth and varying degrees of mortality because of past repeated defoliation. The band of Dry Forest along the southern boundary of the Vinegar Hill-Indian Rock Scenic Area is at the moist end of the Dry Forest spectrum and it was hit particularly hard by the budworm outbreak in 1991, with heavy defoliation and above average mortality levels. This area has been the location of three severe fires in the mid 1990's, no doubt made worst by the increased fuel levels caused by the budworm infestations. Another area of heavy defoliation and mortality lies just north and east of Ragged Rocks in the heads of the Butte, Ruby, and Ragged Creek drainages.

DISEASES

The primary root diseases in Dry Forests are *Annosus* and *Armillaria* which result in small "centers" of mortality and associated gaps in the forest canopy. These areas provided openings for understory vegetation (grasses, shrubs and seedlings) to establish and added to structural diversity. Overall disease levels were generally low because of the effects of fires maintaining increased abundance of species most tolerant to diseases (ponderosa pine and western larch), and the increased ability of trees to ward off infections due to lower stand densities. Frequent fires also helped keep root diseases at lower levels due to the promotion of soil fungi that competes with pathogenic fungi, and through beneficial effects of fire on soil nutrients and nutrient cycling.

Annosus root disease is most prevalent in stands previously entered with overstory and partial overstory removal harvests. Numerous stands show signs of *Annosus* related mortality associated with large old stumps and harvest related disturbance (skid trails). These past harvests resulted in varying degrees of disturbance to the soils and ground vegetation, facilitating the spread of *Annosus* root disease through wind-borne spores infecting large stumps. Mortality from the disease has been identified in both ponderosa pine and grand fir indicating that both the P-strain (pine strain) and S-strain (true fir strain) of the *Annosus* root disease are present.

Armillaria root disease is also present (often with *Annosus*), resulting in mortality in virtually all sizes and species of trees in areas of heavy infection. *Armillaria* root rot is found in several areas in the Tincup Creek and Little Boulder Creek drainages at fairly high levels. *Armillaria* infected stands show considerable amounts of mortality in virtually all sizes and species of trees. Grand fir and

Douglas-fir are most susceptible while, lodgepole pine, Englemann spruce, ponderosa pine, and the occasional western white pine show varying degrees of tolerance. Western larch is the most resistant to the disease, but can still be infected when subject to overstocking.

Dwarf mistletoe was present in low levels throughout the Dry Forests of the watershed. Dwarf mistletoe is predisposed the occasional tree to bark beetle attack, or torching by fire. Brooms created by mistletoe infections were susceptible to fire, especially brooms in the lower crown. Thus, frequent fires likely helped keep overall levels of mistletoe low due to the "fire pruning" of infected branches and through potential negative impacts of the heat and smoke on developing mistletoe plants. The primary species infected by dwarf mistletoe are ponderosa pine and Douglas-fir. Levels of mistletoe infection vary with more severe infections occurring in Douglas-fir mistletoe centers where stands with an infected overstory spread to susceptible understory trees.

As with insects, these forest diseases play an important role in creating structural diversity within forest stands, creating a source of snags and down logs as important wildlife habitat and recycling nutrients which were locked up, in trees and logs—thus maintaining soil productivity. However, at severe levels, these diseases can greatly inhibit the development of a stand, limiting growth and habitat potential.

MECHANICAL DISTURBANCE

Windthrow of occasional trees also adds structural diversity by creating small gaps in the forest canopy, facilitating establishment of understory vegetation. As in the cooler, more Moist Forest types, all of these disturbance agents play an important role in providing a diversity of vegetative conditions and associated habitats across the landscape.

HUMAN DISTURBANCE

Human related disturbances (timber harvest, fire exclusion) have affected the Dry Forests in the analysis area more than the other forest types across the watershed. In the past, the most noticeable harvests focused on the removal of the larger overstory ponderosa pine. Years of selective removal of the largest ponderosa pine, combined with exclusion of fire, resulted in significant changes in the structural and compositional character of the Dry Forests.

The most noticeable feature is the absence of large ponderosa pine trees in many stands. This is particularly evident along the Middle Fork of the John Day River due to early railroad logging; there are few large trees and an abundance of young, small to medium sized trees for the magnitude of this type of harvest in the analysis area. In the early part of the past century, railroad logging removed most of the fire resistant component of fire-adapted forest stands (large ponderosa pine and western larch) in the analysis area (see Appendix E, Map 4—Historic Railroad Logging). The W.H. Eccles Company and the Oregon Lumber Company owned most of the lower elevation forests of the analysis area and began logging and processing lumber at a mill in Austin in 1905. Railroad logging played a prominent role in the history of the watershed. The Oregon Lumber Company constructed a narrow gauge railway from the historic town of Bates down the Middle Fork of the John Day River to the mining towns of Susanville and Galena in 1916. Numerous railroad spurs were built in order to high grade log the seven subwatersheds of the analysis area during this era. Another noticeable trend has been increasing proportions of shade tolerant grand fir and Douglas-fir growing in the understory. This has increased the proportion of stands with multi-strata structures.

> A major portion of the live forest is under stress because stands are too dense, especially the Douglas-fir and true fir understories beneath pines and larch, which increase the likelihood of future mortality in both the understory and overstory." (Johnson, et al, 1995).

Recent harvest patterns have focused on reverting stands back to a species composition similar to historic conditions by removing fir and regenerating to a higher proportion of seral species. Most of these treatments were constrained by arbitrary harvest unit size restrictions; resulting in a patchwork

appearance and fragmentation of stands rather than following historic landscape patterns. A few of the most recent harvest activities have been planned to more closely mimic historic patch sizes, either by using larger unit sizes or by connecting previous smaller patches.

Underburning has also recently been used to reduce the ground fuels and to begin to remove some of the small sized fire intolerant trees species, like fir, from the understory.

Species Composition and Successional Development

The low intensity/high frequency disturbance regime common in Dry Forest type favored fire resistant species (ponderosa pine, western larch, and to a lesser extent larger Douglas-fir) and development of more open stands with little vertical structure. This is because shade tolerant species (grand fir and Douglas-fir) were generally susceptible to frequent fires due to their thinner bark when these trees were young possessing, low hanging crown characteristics that were susceptible to fire. This was also true for Moist Forests occurring in a transitional area with Dry Forests. Smaller understory trees were vulnerable to periodic fires surviving only in openings with too little fuels to carry a fire. The extent of these ground fires likely varied from small areas (less than 10 acres in size) to entire slopes covering thousands of acres depending upon the season, topography, and climatic conditions. The intensity also varied in response to vegetative conditions. Areas missed by frequent fires (wetter northerly aspects) developed conditions where subsequent fires could potentially be of moderate to high intensity, resulting in patches of stand replacement with regeneration stands. This created an uneven mosaic to the landscape of the analysis area with infrequent openings and a small number of younger stands interspersed throughout the area. Higher intensity fire was limited by the preponderance of the larger open park-like stands that prevented large areas of uncharacteristically severe wildfire to occur (see Appendix E, Map 2—Large Fire History Map 6—Forest Stand Types; and Map 7—Forest Stand Structural Stages).

Overall, the frequency of these fires became an agent of stability in these forest ecosystems. Frequent low-intensity fire kept the ground vegetation dominated by fire adapted grasses (such as pine grass and elk sedge) and shrubs (ceanothus, snowberry, Oregon grape), while promoting and maintaining mature forest vegetation dominated by early seral species, such as ponderosa pine, western larch and, to a lesser extent, Douglas-fir. Because of the stabilizing effect of these fires, stands tended to be maintained with early seral species and larger fire resistant trees. Succession to shade tolerant species and associated multi-strata structures only occurred in areas that escaped several fire cycles.

Table 96—Dry Forest Historic and Current Structural Stages(see definitions below).

Dry Forest Structural Stage[51].	**Historic Range of Variability**[52]	**Current** Condition
Stand Initiation (SI)	5-15%	5%
Stem Exclusion Open Canopy (SEOC)	5-25%	42%
Stem Exclusion Closed Canopy (SECC)	5-10%	3%
Understory Reinitiation (UR)	5-10%	7%
Young Forest Multi-strata (YFMS)	5-15%	30%
Old Forest Single-stratum (OFSS)	30-55%	1%
Old Forest Multi-strata (OFMS)	5-15%	12%

This table is a description of potential vegetation group and the historical range denoted therein is based on observation and professional judgment of the historical extent of structural stages. They are estimates from interpreting existing stands—no historical data is available.

See Appendix E, Map 6—Forest Stand Types; and Map 7—Forest Stand Structural Stages.

[51]**Structural Stage Definitions:** see Appendix E Map 7—Forest Stand Structural Stages
Stand Initiation (SI): A single canopy stratum of seedlings and saplings, often established after a stand replacing disturbance.
Stem Exclusion Closed Canopy (SECC): A single canopy stratum of pole to small saw sized timber where shade excludes the development of an understory. See Photo 13 next page.
Stem Exclusion Open Canopy (SEOC): A single canopy stratum of pole to small saw sized timber where a lack of water excludes the development of an understory. Photo 14 next page.
Understory Reinitiation (UI): The overstory has been opened up by natural mortality or thinning, allowing establishment of an understory.
Young Forest Multi Strata (YFMS): Multiple canopy layers provide vertical and horizontal diversity with a mix of tree sizes. Large trees are absent or at low stocking levels. See Photo 7 page 16.
Old Forest Single Strata (OFSS): Large trees are frequent, with no lower canopy levels, often develops after repeated disturbances, such as underburning and a decrease in vigor and forage quality with decreasing shade and increased nutrient. See Photo 5, page 14 and Photo 13, page140.
Old Forest Multi Strata (OFMS): Large trees are frequent along with multiple canopy levels, often developing in absence of disturbances to the understory see Photo 16 page147.
Note: *Interior Columbia Basin Ecosystem Management Project* Supplemental Draft EIS (ICBEMP) document uses the term "story" rather than "strata" in the above definitions.
[52] The percentage of each structural stage thought to have existed across the landscape before Euro-American—American settlement. (See HRV, definition page t cycling provided by burning.

Photo 14 —Stem Exclusion Closed Canopy: A single canopy stratum of pole to small saw sized timber where shade excludes the development of an understory.

Photo 15— Stem Exclusion Open Canopy: A single canopy stratum of pole to small saw sized timber where a lack of water excludes the development of an understory.

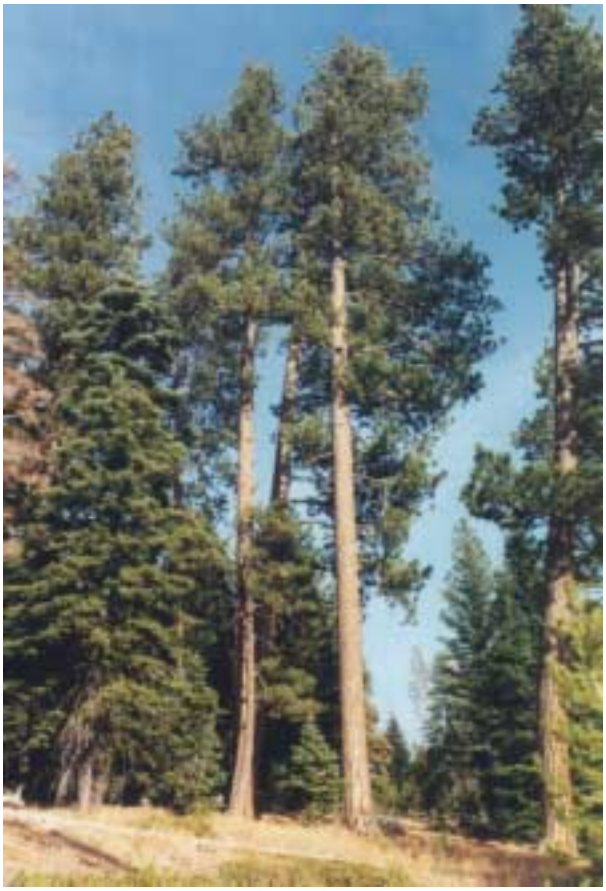

Photo 16—Old Forest Multi-strata: Large trees are frequent along with multiple canopy levels, often developing in absence of disturbances to the understory

3.2.4.2 MOIST FOREST TYPE

Moist forests occupy approximately 11,500 acres (23% of the Southeast Galena Restoration analysis area) on northerly aspects, mid elevations, and in the cooler, wetter draw bottoms throughout the watershed.

In the absence of a major disturbance (fire) Moist Forests has developed forest vegetation dominated by grand fir, Douglas-fir, and spruce. Where frost is frequent, lodgepole pine becomes the dominant species. Ponderosa pine, white pine, western larch, and lodgepole pine are early seral species that are dependent on disturbances to maintain suitable growing conditions.

Species composition varies depending upon the successional development stage, past disturbances, and microclimate[53], or microsite[54] differences. Earlier successional stages are dominated by early seral species such as lodgepole pine, ponderosa pine, western white pine, and western larch; while later stages show increased proportions of climax species such as grand fir, Douglas-fir, or Englemann spruce (in wetter areas). Western larch increases in abundance where past disturbance created bare soil conditions and an adequate seed source was present to re-colonize the disturbed areas. Wetter areas (such as along riparian areas and headwater areas) have increased amounts of Englemann spruce. The Moist Forests occupying the transitional areas with the Dry Forests generally reflect "drier" moist sites sustaining increased proportions of ponderosa pine, western larch, and Douglas-fir.

Understory Plants—Moist Forest

Moist Forest supports a more varied and abundant understory that increases wherever light becomes more available. Elk sedge (*Carex geyeri*) and pinegrass (*Calamagrostis rubescens*) are widespread, along with a number of forbs. Upland shrubs are noticeably sparse and heavily browsed by both wild and domestic ungulates, with little seed set or vegetative reproduction. Riparian shrubs and hardwoods are similarly absent or sparse, and heavily used by ungulates. Habitat for one upland sensitive plant species, clustered lady's-slipper (*Cypripedium fasciculatum*), is abundant, though no populations have been found. Habitat for several other sensitive species is common in riparian zones of Moist Forest, and 13 populations have been documented. Noxious weeds are an occasional problem where the forest canopy has been removed and ground

[53] Microclimate: the climate of small areas, such as under a plant or other cover.
[54] Microsite A small area.

disturbance has created an ideal seedbed as along road right-of-ways. The closed canopy of mature Moist Forest tends to limit the extent of weed infestations in that forest type.

Disturbance Processes—Moist Forest Type

Historically, fires were major agents of change and renewal in the Moist Forests of the watershed. The low frequency of stand replacement fires allowed for the development of large contiguous stands (large patch sizes) that provided high quality core habitats ranging from 200 to 2,000 acres. Fires generally kept the forest in a fairly vigorous condition, which reduced the role of insects and disease as a disturbance process. Currently, the Moist Forests have the most forest health problems.

FIRE

The historic/natural fire disturbance regime in the drier forest types of the Moist Forest Type is best characterized as a high frequency, low intensity regime overlaid with a low frequency, high intensity regime. The relatively frequent disturbances were generally low severity, ground fires that would occur every 10-50 years. Every 100 to 200 years there would be an infrequent disturbance that was of a high severity, stand replacing fire. The extent of these fires was variable due to the topography and could be as large as several hundred acres to over a thousand acres. Fire return intervals in these forest environments were on the magnitude of 50 to 275 years or more (Agee 1993).

Tree mortality was variable, as the tree species that grow in the Moist Forest Type have both thin and thick bark, and shallow and deep roots. Western larch and ponderosa pine have thick bark on medium to large trees. Grand fir, western white pine, Englemann spruce, and Douglas fir have thinner bark, especially when young and are most susceptible to mortality from ground fires. The persistent branches of grand fir and Douglas fir make them very susceptible to torching, often resulting in crown fires which kill all of the trees in a patch. Where Moist Forests occupy a transitional area with the Dry Forests more frequent, low to moderate intensity fires, result in vegetative and structural characteristics more similar to the Dry Forests (see Dry Forest section, page 140).

Where seed sources are present, fires can germinate snowbrush, creating a dense shrub field that could persist for several decades. Snowbrush adds to the diversity of vegetation and is a nitrogen fixing plant that can help replace some of the nitrogen lost through leaching and other processes during and after a fire.

INSECTS

Between the high intensity fires, other disturbance agents (such as insects and diseases) played a role in shaping stand structures and compositions across the landscape.

Endemic levels of bark beetles (primarily mountain pine beetles and fir engraver beetles) occurred in small patches acting as natural thinning agents facilitating the growth and development of residual trees and creating small openings (increasing structural diversity).

Epidemic levels of bark beetles also occurred. Large areas of dense stands of lodgepole that developed following fires created conditions conducive for outbreaks of mountain pine beetles (e.g. mountain pine beetle outbreak of the 1970's) resulting in subsequent stand reinitiation as understory trees respond to increased available light, water and nutrients. Resultant fuel levels associated with the bark beetle mortality also set the stage for regeneration and renewal by creating conditions conducive to subsequent high intensity fires.

Evidence of the 1970s mountain pine beetle outbreak is common in the Moist Forest portions of the analysis area. This past activity resulted in significant mortality in the mature lodgepole and ponderosa pine, creating high levels of down wood and increased representation of shade tolerant species. Following the decline of lodgepole and ponderosa pine, understory grand fir and Douglas-

fir were then released; this progression has resulted in an understory reinitiation stage. As this shade tolerant understory thrives—stands begin developing multi-strata stand structures.

Fir engraver and Douglas-fir bark beetles are other common insects in the Moist Forests. These two insects are endemic, with the exception of increased fir engraver activity in areas where elevated levels of root disease are present. In these areas, root disease decreases the vigor of infected trees, which are then attacked by insects. Douglas-fir bark beetle activity is present in association with the larger diameter, heavily mistletoe infected Douglas-fir trees. Again, the heavy mistletoe infection stresses these trees so that they are highly susceptible to opportunistic insects such as bark beetles.

Defoliating insects (such as western spruce budworm and Douglas-fir tussock moth) also occurred at epidemic levels in these forest types as large areas reached mid to late successional stages. The high proportion of suitable hosts (specifically true firs), multiple canopy layer conditions and increased tree stressors resulting from high stand densities and adverse climatic conditions (i.e. drought periods) have created conditions ideal for outbreaks of defoliators. Defoliation weakened many trees predisposing them to subsequent attack by bark beetles and/or root diseases.

Impacts of the recent (1985-1992) spruce budworm outbreak are widespread, especially in the multi-strata structures. In general across the landscape of the analysis area, the suppressed tree classes of grand fir, Douglas-fir and spruce exhibit poor crowns, reduced growth, and varying degrees of mortality because of past repeated defoliation. The band of Moist Forest along the southern boundary of the Vinegar Hill—Indian Rock Scenic Area was hit particularly hard by the budworm outbreak in 1991, with heavy defoliation and above average mortality levels. This area has been the location of three severe fires in the mid 1990's, no doubt made worse by the increased fuel levels caused by the budworm infestations. Another area of heavy defoliation and mortality lies just north and east of Ragged Rocks in the heads of the Butte Creek, Ruby Creek, and Ragged Creek drainages.

Trees surviving these outbreaks sometimes responded with increased growth due to the nutrient flush provided by the insect excretions and the thinning effects of tree mortality. The reduced canopy coverage and tree densities in heavily defoliated stands created conditions for understory reinitiation of trees, grasses, and shrubs. The mortality of the understory also increased fuel loads and the potential for regeneration by uncharacteristically severe wildfire.

The current and past insect related mortality has also provided significant increases in snag levels and down logs across the Moist Forests in the watershed, providing increased amounts of cavity nesting species habitat.

DISEASES

Root diseases such as *Annosus* and *Armillaria* generally worked at small to medium scales (less than 1 acre to 10-20 acres patches) within stands. Root disease mortality centers created gaps in stands helping to develop multi-strata structural characteristics enhancing both the horizontal and vertical structural diversity of forest stands. Severe levels of root disease resulted in significant tree mortality hindering development of late structural characteristics, while maintaining understory reinitiation and old forest multi-strata structural characteristics. These areas of high mortality were also at increased risk to stand replacing fires which ultimately returned stands to early seral species with greater tolerance to root diseases. Areas that escaped fires, and developed large areas of suitable hosts, likely showed increased levels of root diseases, resulting in changes to the stand structure and composition as levels of root disease intensified.

Other diseases such as gall rust and *atropellis* canker occurred much as they do today, affecting lodgepole growing in humid areas, resulting in stem malformation and subsequent breakage adding to the diversity of tree forms within stands. White pine blister rust was not present during historical times, as it has been introduced since Euro-American occupation of the Pacific Northwest.

Dwarf mistletoe was present throughout these forest types. Lodgepole pine, western larch ponderosa pine, and Douglas-fir dwarf mistletoe were likely present at low levels since infected trees were generally highly susceptible to fire. Stand replacing fires also sanitized stands of mistletoe-infected trees, keeping mistletoe levels low across the forest.

The primary root diseases operating with in the Moist Forests are *Armillaria* and *Annosus* root diseases. Armillaria root rot is found in several areas in the Tincup Creek and Little Boulder Creek drainages at fairly high levels. Armillaria infected stands show considerable amounts of mortality in virtually all sizes and species of trees. Grand fir and Douglas-fir are the most susceptible while, lodgepole pine, Engelmann spruce, ponderosa pine, and the occasional western white pine show varying degrees of tolerance. Western larch is the most resistant to the disease, but can still be infected in some instances.

Annosus root disease is often found in association with *Armillaria*, and is also prevalent in many stands previously entered with partial removal harvests. These stands show signs of Annosus related mortality associated with stumps and harvest related soil disturbance (skid trails). Most of the mortality is associated with grand fir indicating that it is the S-strain 4(true fir strain) of this root disease.

Indian paint fungus is common in grand fir throughout Moist Forests. Mature and suppressed grand firs have the highest incidence of the fungus. Indian paint fungus plays an important role in providing cavity-nesting habitat in live trees and subsequent snags. Large hollow, decayed live grand fir trees (30+ inch diameter trees) are often sought out as denning habitat by black bears and other mammals, and also provide excellent primary and secondary cavity nesting habitat for many birds and some mammals.

Western gall rust and *atropellis* canker are also fairly common in Moist Forest stands with a significant lodgepole component. These stem diseases cause cankers that can result in girdling the tree or at least creating a weak point that is susceptible to subsequent wind/snow breakage.

It is difficult to discern to what degree the blister rust and past logging has affected the distribution of white pine in the area. It is believed there was more white pine in areas that were logged in the earlier parts of this century. The introduction of white pine blister rust into western forests has caused a reduction in tree vigor and some mortality, although the white pine in the drier Blue Mountain environment seem to be fairly resistant to the disease. The area from Dixie Butte to Ragged Rocks contains far more white pine than any other area on the Malheur National Forest.

As with insects, these diseases play an important role in the forest by adding to structural diversity by creating openings in the forest canopy and snags, and sources of down logs important for wildlife habitat and soil productivity. At elevated levels, these diseases select for species that are more resistant, such as larch and pines. It can also inhibit stand development, limiting growth, tree size, and stand density.

MECHANICAL

Windthrow and breakage of occasional trees also added structural diversity by creating small gaps in the forest canopy allowing the release of the understory vegetation. Wind related disturbance was also important in recruiting habitat logs to the forest floor and creating live snags where tops were broken out, but the tree remained alive.

HUMAN

Fire exclusion, sheep and cattle grazing, and past harvest activities have also changed the condition of the Moist Forests. These human disturbances have affected the structural character, patch size, and species compositional across the watershed. In general, human disturbance has reduced large tree structures, reduced patch sizes, increased fragmentation, and reduced the proportions of fire tolerant species.

All of these disturbance processes played an important role in providing a diversity of vegetative conditions and associated habitats across the landscape.

Species Composition and Successional Development

Species compositions and structural characteristics of the Moist Forests were largely dependent upon the stage of succession of the stand, and associated landscape as dictated by the time since the last major disturbance (namely high intensity fire). In general, early successional stages were dominated by shade intolerant species lodgepole pine, western larch, western white pine and ponderosa pine (on lower elevation 'drier,' areas of the Moist Forest Type) while shade tolerant species such as grand fir, Douglas-fir and subalpine fir (in 'wetter' higher elevation areas of the Moist Forest Type) increased as stands developed toward later successional conditions.

The historic species composition of the Moist Forest had higher proportions of fire tolerant early seral species (ponderosa pine, lodgepole pine, and western larch) and lesser amounts of fire intolerant species (grand fir, Engelmann spruce, and Douglas-fir) prior to Euro-American influences. Where historic fires coincided with good western larch seed years, stands likely developed significant proportions of larch as larch establishment does very well on bare ground. Lodgepole pine generally dominated in cold air pockets, which favored it over the less cold hardy species. Western white pine were likely present in greater proportions since blister rust, an exotic disease, had not been introduced.

Table 97 Moist Forest HRV and Current Structural Stages (see definitions page 145).

Moist Forest Structural Stage(see definitions page 145)	**Historic Range of Variability**[55]	**Current** Condition
Stand Initiation (SI)	10-30%	6%
Stem Exclusion Open Canopy (SEOC)	5-10%	6%
Stem Exclusion Closed Canopy (SECC)	10-20%	4%
Understory Reinitiation (UR)	10-20%	6%
Young Forest Multi-strata (YFMS)	10-20%	39%
Old Forest Single-stratum (OFSS)	5-15%	5%
Old Forest Multi-strata (OFMS)	15-40%	34%
NOTE: This table is a description of potential vegetation and the historical range denoted therein is based on observation and professional judgment of the historical extent of structural stages. They are estimates from interpreting existing stands,no historical data is available.		

See Appendix E, Map 6—Forest Stand Types; and Map 7—Forest Stand Structural Stages.

3.2.4.3 LODGEPOLE PINE FOREST TYPE

Lodgepole pine is found throughout the cold, moist, and Dry Forest groups. Because lodgepole pine behaves the same throughout the various types, it is covered as a separate component. Lodgepole forests have evolved with low frequency, high intensity fire regimes.

Lodgepole pine occurs primarily as early seral stands, giving way to grand fir and/or subalpine fir as the lodgepole declines. Seral lodgepole forest acreages are included within the various forest types it is found in.

Lodgepole are also present as a climax species in the colder "frost pocket" areas where the cold tolerant, hardy lodgepole are favored and establishment of other species is inhibited; or in areas historically visited by high intensity fires every 80-120 years. These areas are environmentally induced "climax" lodgepole forests. These areas comprise about 1100 acres (3% of the Southeast Galena area).

Moist forest lodgepole sites have western larch and minor amounts of grand fir intermixed in the overstory. Exclusion of fire has allowed shade tolerant species, such as grand fir, to establish in the understory. With continued suppression of fire, these sites will eventually become dominated by grand fir.

Dry Forest lodgepole sites have minor inclusions of ponderosa pine and Douglas-fir. Where the lodgepole forests are intermixed with Dry Forest types, lodgepole are expanding outside of the colder areas (draws, depressions) into the adjacent uplands, resulting in lodgepole understories beneath ponderosa pine and Douglas-fir dominated overstories. Lodgepole are also expanding into meadow and grass areas.

Species Compositions and Successional Relationships

Species compositions and structural characteristics of the lodgepole forests were largely dependent upon the successional stage of the stand, and associated landscape. This was set in place by the last major disturbance (that is, the last high intensity fire or mountain pine beetle attack). In general, early successional stages were dominated by seral lodgepole pine. In a few cases where disturbance was absent for a longer period, shade tolerant species such as grand fir, Douglas-fir and sub-alpine fir (in moist and higher elevation areas) increased as stands developed toward later successional conditions.

Disturbance Processes—Lodgepole Pine Forest Type

Fires, insects, diseases, and human related disturbances have impacted the structural character and species compositions of many of the lodgepole stands in the watershed.

FIRE

The most important disturbance process in lodgepole pine forests has been fire. Historically, fires occurred relatively infrequently in the lodgepole forests. These fires were generally high intensity, stand replacing fires capable of regenerating large areas of lodgepole forest. In absence of fire, stands have become overstocked as trees grew larger and becoming prime candidates for attack by mountain pine beetle. Lodgepole pine stands either succeed to shade tolerant species (grand fir, subalpine fir, Englemann spruce), or die out and accumulate additional fuels and burn again.

The historic/natural fire disturbance regime in these forest types is best characterized as a low frequency, high intensity regime. These relatively infrequent disturbances were generally high severity, stand replacing fires. In some occasions, a low intensity ground fire would smolder from log to log, removing down fuel, but not killing the overstory. The extent of fire was highly variable due to the topography and the often patchy distribution of the lodgepole forests. Fire size could be as small as one clump of trees or as large as several hundred acres. Fire return intervals in these forest environments were on the magnitude of 50-275+ years (Agee 1993).

INSECTS

Endemic levels of bark beetles (primarily mountain pine beetles and fir engraver beetles) occurred in small patches acting as natural thinning agents facilitating growth and development of residual trees and creating small openings, increasing structural diversity.

Epidemic levels of insects also occurred. Large areas of dense stands of lodgepole that developed following fires created conditions conducive for outbreaks of mountain pine beetles (such as 1970's mountain pine beetle outbreak) resulting in subsequent stand reinitiation as understory trees responded to increased available light, water, and nutrients. Resultant fuel levels associated with bark beetle mortality also set the stage for regeneration/renewal by creating conditions conducive for subsequent high intensity fires.

Evidence of the 1970's mountain pine beetle outbreak is prevalent throughout the Lodgepole Forest type. This past mountain pine beetle activity resulted in significant levels of mortality, killing the

majority of mature lodgepole in many stands. The present day result is high levels of jack-strawed wood and generally abundant regeneration in the openings. This past mountain pine beetle related mortality and subsequent growth and establishment of the understory has resulted in the development of areas of understory reinitiation and multi-strata stand structures. Residual lodgepole pine in beetle-impacted stands generally exhibit reduced crowns (<20% live crown) and slow growth.

As a result of fire suppression, areas historically maintained in lodgepole by fire show increased shade tolerant true firs (grand fir and subalpine fir) growing in the understory. This can change stand characteristics to a true fir stand, replacing lodgepole pine.

Other insects common in the lodgepole forests include tip weevils and shoot borers which occur primarily in younger lodgepole stands, resulting in minor levels of top kill and associated deformity (forked, multiple tops) adding to the diversity of tree forms within stands.

DISEASES

Root diseases such as *Annosus* and *Armillaria* generally worked at small scales (less than 1 acre) within stands. Root disease mortality centers created gaps in stands, helping to develop multi-stratum structural characteristics enhancing both the horizontal and vertical structural diversity.

Localized areas of severe levels of root disease resulted in significant tree mortality hindering development of late structural characteristics while maintaining understory reinitiation and young forest multi-strata structural characteristics. These areas of high mortality were also at increased risk to stand replacing fires, which ultimately returned stands to early seral species with greater tolerance to root diseases. Areas that escaped fires and developed large areas of suitable hosts likely showed increased levels of root diseases, resulting in changes to the stand structure and composition as levels of root disease intensified.

The most common disease in the lodgepole forests is western gall rust. Essentially all stands have infections of gall rust. Severe infections cause stem malformation, while bole infections can girdle trees. Seedlings are especially vulnerable to the rust and the rust generally favors the fastest growing trees. *Atroppellis* canker is another fungus common in dense, young lodgepole stands. It too causes stem and bole malformations in infected trees. Both diseases increase the diversity of tree forms within stands, developing snags by physically girdling trees, or providing a weak point in the tree.

Dwarf mistletoe is also present in lodgepole forests. Levels of mistletoe infection vary from slight to heavy, with the most severe infections in the older, decadent lodgepole stands. Lodgepole mistletoe was likely present at low levels since infected trees were generally highly susceptible to fire. Stand replacing fires also sanitized stands of mistletoe-infected trees, keeping mistletoe levels low across the landscape. These infections can greatly reduce the growth potential of the understory, but are important for providing a variety of wildlife habitats. Characteristic "witches brooms" produced on infected branches provide potential nesting and roosting platforms, and the proliferation of buds of the host and aerial shoots of the mistletoe plants provide a source of food for a variety of wildlife species.

Other diseases such as gall rust and atropellis canker occurred as they do today, affecting lodgepole growing in humid areas, resulting in stem malformation and subsequent breakage adding to the diversity of tree forms within stands.

MECHANICAL DISTURBANCE

Windthrow and breakage of occasional trees also added structural diversity by creating small gaps in the forest canopy allowing release of understory vegetation. Wind related disturbances were also important in recruiting habitat logs to the forest floor.

All of these disturbance processes played an important role in providing a diversity of vegetative conditions and associated habitats across the landscape.

HUMAN DISTURBANCE

The primary human related a disturbance affecting the lodgepole pine forests has been the exclusion of fire and harvesting. Harvesting of lodgepole products includes house logs, small saw logs, posts and poles, and firewood. The openings created have often regenerated naturally back to lodgepole, maintaining the species on these sites.

In the absence of fire, many of the fire maintained lodgepole forests are developing significant grand fir and subalpine fir components following their natural successional potential. This is resulting in decreased amounts of lodgepole pine forests across the watershed as these stands convert to shade tolerant species. Ultimately, these stands will return to lodgepole following the next large stand replacement fire. Fire exclusion also played a role in the 1970's mountain pine beetle outbreak. Exclusion of fire across the landscape allowed large areas of dense lodgepole to develop, conditions conducive to bark beetle attack.

Table 98 Lodgepole Pine Forest HRV and Current Structural Stages (see definitions page 145).

Structural Stage((see definitions page 145))	Historic Range of Variability[1]	Current Condition
Stand Initiation (SI)	5-30%	0%
Stem Exclusion Open Canopy (SEOC)	5-10%	3%
Stem Exclusion Closed Canopy (SECC)	5-50%	18%
Understory Reinitiation (UR)	5-15%	24%
Young Forest Multi-strata (YFMS)	5-15%	39%
Old Forest Single-stratum (OFSS)	5-10%	16%
Old Forest Multi-strata (OFMS)	5-15%	12%

This Table is a description of potential vegetation group and the historical range denoted therein is based on observation and professional judgment of the historical extent of structural stages. They are estimates from interpreting existing stands—no historical data is available.

See Appendix E, Map 6—Forest Stand Types; and Map 7—Forest Stand Structural Stages.

3.2.4.4 COLD FOREST TYPE

Cold forests occupy approximately 2,000 acres (4% of the Southeast Galena Restoration analysis area) on high elevation sites, northerly aspects, and in the cooler, wetter draw bottoms throughout the watershed . In the absence of a major disturbance such as fire, Cold Forests will develop forest vegetation dominated by subalpine fir and Englemann spruce. Where frost is frequent, lodgepole pine will be the dominant species. White bark pine and lodgepole pine are early seral species that are dependent on disturbances to maintain suitable growing conditions.

Understory Plants

Understory vegetation in Cold Forests has probably changed the least of any forest type, since management was initiated. Because of dense canopy cover, understory species tend to be sparsely represented and tolerant of shade. Riparian shrubs are few, except where disturbance has created gaps. A notable exception is the high elevation sub-alpine steppe of Dixie Butte and the Vinegar Hill Scenic Area. The steppe vegetation consists of shrubs (mostly mountain sagebrush), grasses, and forbs tolerant of the short growing season and harsh climate. While most of the plants on these high elevation sites are native, the species mix has been severely altered by past sheep grazing practices. Soil compaction and loss have decreased capacity to support native grasses, and increased the cover of "weedy" increasers such as fleece flower (*Polygonum phytolaccifolium*) and coneflower (*Rudbeckia occidentalis*).

Species Compositions and Successional Relationships

Species compositions and structural characteristics of the Cold Forests were largely dependent upon the stage of succession of the stand and associated landscape as dictated by the time since the last major disturbance (i.e., high intensity fire). The conditions that affect disturbances in the Cold Forests have not changed substantially over time, resulting in little change in the fire severity from historic times to the present.

Lodgepole pine and whitebark pine are the primary seral species that would initially occupy a site. In stands with a longer fire-free interval, climax species such as subalpine fir and Englemann spruce would become established. Stands with a short fire return interval were maintained in lodgepole pine, because succession was continually reset, never getting past the early seral stages. They are discussed in the preceding lodgepole pine section. Whitebark pine were also likely present in greater proportions since blister rust, an introduced disease, had not been established.

Disturbance Processes—Cold Forest Type

Difficult access, low timber values, and political pressures of not entering Cold Forests in roadless areas discouraged timber harvesting, so there has been little impact from logging or road building. Near historic mining areas there was some tree removal for mining structures and mine props.

FIRE

Historically, wildfire was the major disturbance affecting Cold Forests. Between high intensity fires; other disturbance agents, such as wind throw, insects, and diseases, also played a role in shaping stand structures and compositions across the landscape.

The historic/natural fire disturbance regime in these forest types is best characterized as a low frequency, high intensity regime. These relatively infrequent disturbances were generally high severity, stand replacing fires.

Fire starts are frequent, due to the ridge top location of the Cold Forest stands. The extent of fires was highly variable due to topography and the often patchy distribution of Cold Forests, which are often interspersed with alpine meadows. Fire size could be as small as one clump of trees or as large as several hundred acres. Fire return intervals in these forest environments were on the magnitude of 50-275+ years (Agee 1993).

Tree mortality from fires is high in Cold Forests, many of the trees in Cold Forests retain branches to the ground and grow in dense, multistory patches. This predisposes them to torching and crowning fire behavior which kills all of the trees in the patch. Additionally, the thin bark of these species does not protect them from basal heating, resulting in high mortality—even by light ground fires. Stand establishment in Cold Forests after disturbance is often very slow, sometimes as long as a century.

Fire is still the most influential disturbance process occurring in Cold Forests. The impact of fire suppression is much less in this forest type than in other types, due mainly to long fire return intervals. The main effect of fire suppression over the last 70 plus years has been to reduce the diversity of age classes, allowing more stands to grow older than would naturally have occurred.

INSECTS

Endemic levels of bark beetles (primarily mountain pine beetles and fir engraver beetles) occurred in small patches acting as natural thinning agents, facilitating the growth and development of residual trees and creating small openings (increasing structural diversity).

Epidemic levels (populations that maintain themselves in a local area below outbreak population levels) of insects periodically occur in Cold Forest types. Large areas of dense stands of lodgepole that developed following fires created conditions conducive for outbreaks of mountain pine beetles (such as the 1970s mountain pine beetle outbreak) resulting in subsequent stand reinitiation as

understory trees responded to increased available light, water and nutrients. Spruce bark beetles are also found in Cold Forests. These insects are active within burned areas, blowdown areas, and areas with elevated levels of root disease. Resultant fuel levels associated with bark beetle mortality also set the stage for regeneration/renewal by creating conditions conducive for subsequent high intensity fires.

Defoliating insects such as western spruce budworm and Douglas-fir tussock moth also occurred at endemic levels in these forest types. They caused minor damage, weakening some trees and predisposing them to subsequent attack by mountain pine beetles and fir engraver. Impacts of the recent (1985-1992) western spruce budworm outbreak were moderate, with damage occurring mainly in the multi-strata structure stands. Budworm defoliation did not cause the widespread top kill or mortality that it did in the Moist Forest type.

The current and past insect related mortality has provided significant increases in snag levels and down logs. While it provides wildlife habitat, insect related mortality has also increased fuel levels, increasing size and intensity of future stand replacement fires.

DISEASES

Root diseases such as *Annosus* and *Armillaria* generally worked at small scales (less than 1 acre) within stands. Root disease mortality centers created gaps in stands helping to develop multi-stratum structural characteristics enhancing both horizontal and vertical structural diversity. Severe levels of root disease resulted in significant tree mortality, hindering development of late structural characteristics while maintaining understory reinitiation and young forest multi- strata structural characteristics. These areas of high mortality were also at increased risk to stand replacing fires which ultimately returned stands to early seral species with greater tolerance to root diseases. Areas that escaped fires and developed large areas of suitable hosts likely showed increased levels of root diseases resulting in changes to the stand structure and composition as levels of root disease intensified.

Other diseases such as gall rust and *atropellis* canker occurred as they do today, affecting lodgepole growing in humid areas, resulting in stem malformation and subsequent breakage, adding to the diversity of tree forms within stands. White pine blister rust was not present during reference times as it has been introduced since Euro-American occupation of the Pacific Northwest.

Dwarf mistletoe, a parasitic plant, was another disease present throughout these forest types. Lodgepole mistletoe was likely present at low levels since infected trees were generally highly susceptible to fire. Stand replacing fires also sanitized stands of mistletoe infected trees, keeping mistletoe levels low across the landscape.

Root diseases in the subalpine fir have not caused major problems. *Tomentosus* root disease, which is common in the mature spruce, makes it vulnerable to wind throw and subsequent spruce beetle attack.

White bark pine is susceptible to white pine blister rust and it is suspected that blister rust is responsible for the decline in the numbers of white bark pine in the area. Due to the low numbers of white bark pine in the watershed, any additional loss due to insects, diseases, and competition from other species is a concern.

MECHANICAL DISTURBANCE

Windthrow and breakage of occasional trees also added structural diversity by creating small gaps in the forest canopy allowing the "release" of understory vegetation. Wind related disturbance was also important in recruiting habitat logs to the forest floor and creation of live snags where tops were broken out, but the tree remained alive.

HUMAN DISTURBANCE

The main human disturbance has been fire suppression, which has allowed stands to follow successional paths farther than otherwise would have happened with more fires. Logging and other activities have been quite limited in the Cold Forests, mainly just localized use around mining operations for mine props and cabins.

All of these disturbance processes played an important role in providing a diversity of vegetative conditions and associated habitats across the landscape.

Table 99 Cold Forest HRV and Current Structural Stages (see definitions page 145).

Structural Stage (see definitions page 145)	Historic Range of Variability[1]	Current Condition
Stand Initiation (SI)	20-25%	0%
Stem Exclusion Open Canopy (SEOC)	5-10%	16%
Stem Exclusion Closed Canopy (SECC)	5-20%	9%
Understory Reinitiation (UR)	5-10%	0%
Young Forest Multi-strata (YFMS)	20-30%	57%
Old Forest Single-stratum (OFSS)	5-10%	0%
Old Forest Multi-strata (OFMS)	15-25%	18%

This Table is a description of potential vegetation group and the historical range denoted therein is based on observation and professional judgment of the historical extent of structural stages. They are estimates from interpreting existing stands—no historical data is available.

Stand structures in the Cold Forest Type are different than the other vegetation groups. With generally longer time for stand initiation, which can take as long as a century, a large percentage of the stands were in this stage. Stem exclusion is usually reached at fairly open densities, and due to the relatively short lived seral species, understory reinitiation may start before stand initiation has been completed. It would be rare for most of the climax tree species, with their relatively short life-span, to become large enough to be old forest multi-strata (Agee, 1993). See Appendix E, Map 6—Forest Stand Types; and Map 7—Forest Stand Structural Stages.

3.2.4.5 WOODLAND FOREST TYPE

Woodlands occupy approximately 1,400 acres (3% of the Southeast Galena analysis area) on dry, thin soil areas that are marginal for supporting forested stands of trees. The typical appearance is of a savanna with a few widely spaced ponderosa pine trees and juniper.

Species Compositions and Successional Relationships

Species compositions and structural characteristics of woodlands were largely dependent upon frequent fire and occasional insect attacks during droughts. Widely spaced ponderosa pine are the only tree species in any numbers, with an understory of juniper in varying amounts. With fire exclusion, both juniper and ponderosa pine have expanded their range into previously fire maintained meadows and have increased their numbers in the savannah areas.

Disturbance Processes—Woodland Forest Type

FIRE

Fire was the dominant disturbance process in woodlands, occurring as frequent, low intensity underburns in the past.

HUMAN DISTURBANCE

Human related disturbances (timber harvest, fire exclusion) have affected woodlands. Selective removal of the occasional ponderosa pine, combined with exclusion of fire, resulted in significant changes in the structural and compositional character of the woodlands.

3.2.4.6 OTHER VEGETATION TYPES

Sub-Alpine Meadows

Many of the sub-alpine meadows were maintained in a more open state by periodic fire that would kill invading trees. The reduction of the amount of burning by fire exclusion policies has led to a gradual increase in the amount of forested lands at the expense of sub-alpine meadows.

Hardwoods(including Aspen)

Both aspen and cottonwood are generally limited to stands of a few decadent trees. Condition of aspen stands has been previously discussed (see 1.2.1.4 Undesired Condition: Vegetation Outside Historical Range of Variability, page 14). Alteration of stream flooding patterns that used to provide the preferred substrate for cottonwood seed germination along the lower reaches of creeks and in the river floodplain has reduced cottonwood habitat. Grazing has virtually eliminated any recruitment of young trees, except occasionally in road cuts where terrain restricts access to animals that would browse these plants.

Examination of vegetation in the vicinity of Placer Gulch and Davis Creek and remnant vegetation along Big Boulder, the Middle Fork of the John Day River, and other streams in the watershed suggests that large cottonwood galleries were present historically. Aspen stands were probably larger, and more common, based on informal evaluations of present conditions. Within the analysis area most aspen and cottonwood are limited to stands of a few decadent trees. Remnant stands indicate that it is likely that existing aspen stands are only 10% of historical stand levels (Tatum 2001).

Riparian Meadows

Riparian meadows along the Middle Fork John Day have been converted to agricultural use, currently cattle grazing. Even meadows that were not plowed by earlier settlers have undergone species conversion through loss of the water table. As a result, moisture-loving species such as tufted hairgrass (*Deschampsia cespitosa*) and common camas (*Camassia quamash*) have been replaced with Kentucky bluegrass, meadow foxtail (*Alopecurus pratensis*), and other “pasture” grasses, and weedy increasers such as teasel (*Dipsacus fullonum*). Smaller riparian meadows at higher elevations have suffered from on-going overuse, sometimes by large numbers of elk as well as cattle, with a resultant conversion to rhizomatous sedges and rushes, or to Kentucky bluegrass if the water table has dropped. Plant diversity in these meadows has probably declined since historic times.

Rock Outcrops

Rock outcrops occasionally support relict populations of mountain mahogany (*Cercocarpus ledifolius*), many of which may have shrunk from their historic extent since fire suppression has allowed encroachment and shading by conifers. Several serpentine outcrops support unique plants that are serpentine obligates such as Shasta fern (*Polystichum lemmonii*).

Threatened Endangered and Sensitive Plant Species

Populations of 6 plant species designated as sensitive in USDA FS Region 6 have been located within the analysis area, for a total of 15 occurrences. The species found are 5 moonworts (*Botrychium crenulatum, B. lanceolatum, B. minganense, B. montanum* and *B. pinnatum*), and one sedge (*Carex interior*). Large, representative portions of each subwatershed have been surveyed for sensitive plants, with emphasis on their potential habitat. Not all the potential habitat has been surveyed.

*(See also **1.2.1.4 Undesired Condition: Vegetation Outside** Historical Range of Variability, page 14; **1.2.1.4 Undesired Condition: Vegetation Outside** Historical Range of Variability, page 14; **ISSUE 1.4.9—Inadequate Amount of Treatment**, page 33; **ISSUE 1.4.10—Insufficient Pileated Woodpecker Habitat**, page 33;and **ISSUE 1.4.11—Effects on Connectivity for** Wildlife, page 34.)*

3.2.5 High Wildfire Hazard

The analysis area once sustained resilient ecosystems, which could withstand a diverse array of natural disturbances. Wildfires were small, and rarely burned into the crowns of these large trees. M.L. Erickson, Assistant Forest Inspector, assessed fire danger in 1906.

> *Forest fires have done little damage to the reserve, and there is not a great possibility of extensive forest fires occurring on any part of the reserve. The most dangerous region is the high altitude in the Strawberry Mountains. In general, the country consists of an open forest with very little underbrush so that a fire, if started, would burn very little timber and would also be easy to extinguish. The main business of the reserve will be for some time, the care of grazing matters, and no extra men will be needed for patrol work alone. There are a few suitable sites in the reserve which will afford lookout stations, also that a ranger may be able to see over large areas and thus avoid riding over territory for the purpose of locating small fires. No lookout stations, therefore, are recommended, except as will be suitable for natural topographic features.* **From "Report on Blue Mountain (West) Reserve Oregon" 1906**

Despite an appearance of stability the Southeast Galena Analysis area, along with other similar portions of the Galena watershed has had the resilience of its ecosystems diminished to a state where it exists at a critical stage (see 3.2.4 Vegetation page 139). Unless methods to reverse current trends are applied—important habitat and resources will be lost. The magnitude and intensity of that loss can be measured by recent uncharacteristically severe wildfire that has occurred in the Galena Watershed.

Recent Uncharacteristically Severe Wildfire—1996 Summit Fire

In the past decade 40,264 acres of stand replacement fire (uncharacteristically severe wildfire) has burned across the landscape of the Galena Watershed, removing vegetative cover on approximately one third of this area. The 1996 Summit Fire, was an example of an uncharacteristically severe wildfire (see Appendix E, Map 2—Large Fire History). Burning through two National Forests and across private lands, this fire started on the Umatilla National Forest and burned 37,961 acres of Galena watershed—burning to the current Analysis Area (Galena WA, Supplement—2002)boundary causing severe effects to watershed resources. The vegetation conditions that exist in the Southeast Galena Restoration analysis area, are similar to those which carried the Summit Fire, therefore uncharacteristically severe wildfire such as the Summit Fire may be likely to occur in the future

(Johnson, et al, 1995). The Summit Fire Recovery Project,[56] was successfully implemented in response to the 1996 Summit Fire. This fire, caused a large array of natural resource damage (c.f. Summit Fire Recovery Project FEIS 1997; page 3-1-88). Among the many resources damaged were sensitive and threatened fish species as this large conflagration contributed detrimentally to elevated stream temperatures and short-to mid-term sediment delivery concerns in the John Day River. In addition to excess sediment, this large forest fire, has extensively reduced fish and wildlife habitat in the watershed. Among other damage to resources across the landscape of the watershed, the Summit Fire caused a reduction in crown density, which now allows a large area of the watershed's snow pack to have a longer and more intense exposure to sunlight, because of this—earlier snowmelt occurs on approximately one third of the watershed. Additionally, because the loss of overstory vegetation is causing an earlier snowmelt, water that was formerly being held into the late (summer) season is now being released earlier than it once was (cf., 3.2.1—Early Season Peak Flows, page 113). Before the Summit fire, water storage capacity was already diminished in the Galena watershed due to mining, logging, roads, and livestock grazing and was leaving the landscape earlier than in pre-settlement times. The consequence of a reduction in water storage capacity is that not enough water flow is retained through to drier seasons. The undesirable condition of water leaving the landscape earlier in the season has increased during the peak seasonal flows, which were smaller flows when a greater storage capacity existed (see 3.2.1—Early Season Peak Flows, page 113).

[56] Malheur National Forest *Summit Fire Recovery Final Supplemental Environmental Impact Statement* 1998

Photo 17—View toward Indian Rock before Summit fire 1996.

Photo 18— View (below)toward Indian Rock after the Summit Fire of 1996 (an example of an uncharacteristically severe wildfire, also see Appendix E, Map 2—Large Fire History).

Late summer and early fall movement of both fish and terrestrial wildlife depend upon the availability of water during critical dry months, during these months in the Galena watershed now less flow occurs than before the Summit fire. Additionally, the loss of vegetation from the Summit Fire has reduced the available habitat for a number of wildlife species. This large-scale removal of riparian and upland vegetation has reduced the viability of streams and forest stands to provide habitat for aquatic and terrestrial wildlife in the watershed (see 3.2.3 Aquatic Habitat, page 125). Additionally, another large fire with the magnitude and severity of the Summit Fire presents an unacceptable risk to all resources throughout the analysis area.

Wildfire Hazard and Risk

The threat of uncharacteristically severe wildfire is present with every fire season under current forest stand conditions. This is because of uncharacteristically overstocked conditions, high levels of forest litter, fuel accumulations, increased ladder fuels, and increased proportions of fire-intolerant trees such as Douglas-fir and grand fir. As stated previously, the natural processes of these fire adapted ecosystems once promoted open, park-like stands of trees, where fire regimes tended toward regular low intensity burns. Fire behavior will no longer be the historic low intensity burns that invigorated forest stands, shrub communities, and aspen stands, rather they present the threat of large areas incurring resource damage which will take decades to achieve recovery

Wildfire suppression is management policy of the Malheur National Forest *Land and Resource Management Plan*, and optimistically, suppression would be the outcome of wildfires starting in the analysis area in every case. Only two per cent of fires nationwide escape in a manner that would produce an uncharacteristically severe wildfire such as the Summit Fire. Yet, many factors involving risk and hazards exist in the Southeast Galena Analysis area which cause this area to be more vulnerable to uncharacteristically severe wildfires than other areas. **Fire Risk** *is a term relating to the probability of a fire starting,* while **Fire hazard** *relates to fuel accumulation or loadings* (see Appendix F for more information).

There is a high level of lightening strikes in the Blue Mountains (Agee 1993). Fire risk at 1.7 fires per thousand acres is very high. Fire hazard is determined by the combinations of slope, aspect and ground fuels, the analysis area is in a mostly high hazard condition due to steep slopes high proportion of south aspects and vegetation conditions. Most of the analysis area is characterized by a fire behavior rated at a Fuel Model 9[57] (Timber, loosely compacted litter); and Fuel Model 10 (Timber, heavy litter) historically, most of the Dry and Moist forest types were a fuel Model 2 (Timber, grass understory) in this fuel model there can be a high rate of spread though fine ground fuels,. however, crown fires were historically rare. Fuel Model 9 is typical of the existing dense Ponderosa Pine stands in the analysis area. Fires can run through the surface litter at a high rate because of the loose arrangement. Concentrations of dead and down woody material will contribute to possible torching, spotting, and crowning. Fuel Model 10 is typical of the existing late succession Moist and Dry Forest types that are mixed conifer in the analysis area. Fires in this fuel model can result in crowning and spotting.

In addition to heavy concentrations of ground fuels, the presence of ladder fuels is a big factor that can result in the fire reaching the crowns. Dense multi-storied stands have a high potential for crown fires. A model has been developed to determine risk of crown fires but there was not sufficient stand data or time to apply it to the project. Instead, a combination of stand structure and density was used as an indicator of crown fire potential. The crown fire hazard was determined to be high for 66% of the Dry Forest type, 60% for the Moist Forest type, 98% for the Lodgepole Forest type and 84% for the Cold Forest type. Of primary concern are the high crown fire hazards for the Dry and Moist Forest types because these types, for the most part, burned historically with low intensity ground fires. The Lodgepole and Cold Forest types are within HVR for crown fire hazards.

Crown fire risk can be reduced by treatment of high levels of dead ground fuels, by removal of ladder fuels by understory removal and by thinning of trees to increase the distance between trees to allow heat from fires to escape instead of building up under the crowns .

Large wildfires under current fuel conditions are dangerous and unpredictable for wild land firefighters, local residents and forest users presenting a potential for injury, loss of life, structures

[57] Fuel Models are classified by the amount, type arrangement of ground fuels as developed by the National Forest Fire Laboratory. See Appendix F for a complete list of Fuel Models.

and resource damage. Large fires can spread outside the Southeast Galena analysis area and threaten resources and structures on a landscape scale (cf. 4.3.9—Forest Stand Sustainability and Resilience, page 397). Likewise, the analysis area could be threatened by large fires in adjacent watershed areas because similar fuel conditions exist in surrounding areas.

Wind Event in Vincent and Vinegar subwatersheds

On July 2, 1998, a severe windstorm blew down thousands of trees in the headwaters of Vinegar and Vincent Creeks. This event (variously referred to as the Banner wind event of 1998, or the Banner Blowdown) created a 1400-acre area of wind thrown trees which left, root sprung and down portions of damaged trees, creating a large amount of ground fuels in riparian areas. About 300 acres within the center of the area sustained an almost complete blowdown. The area presents an additional fire-risk from an excess loading of ground fuels—and may pose a threat of insect infestation.

The majority of the damaged acres fell within riparian areas of these subwatersheds. Concern for the riparian area upstream for sensitive and threatened fish species has prevented a salvage effort of this area. The blow down created excess fuels and prompted a Forest Service review of insect infestation of the area (*Insect and Disease Review of Banner Blowdown* (USDA FS 1998 BMZ-98-5). Within he riparian areas , the blowdown consisted of 45 percent Englemann spruce, 20 percent lodge ole pine, 15 percent western larch, 10 percent white fir, nine percent Douglas-fir, and one percent ponderosa pine.

This area is classified as Fuel Model 13 and is a concern, not for the size, but for the amount of fuels. Heavy fuels in all size classes are present in this area. The resistance to fire control is high. Loosely compacted fuels that can allow high fire intensities and the difficulty of walking through the jack straw timber, make the area a safety hazard to fire fighters, thereby increasing the risk that a fire in the area can escape initial attack and could result in an uncharacteristically severe wildfire.

Private Land Interface

The *National Wildland and Prescribed Fire Management Policy* of August, 1998 lists priorities for protection from wildfires. These protection priorities are: (1) human life and (2) property and natural/cultural resources. If it becomes necessary to prioritize between property and natural/cultural resources, this is done based on relative values to be protected, commensurate with fire management costs. Location of private property and structures on private lands are concerns when wildfires occur, and when prescribed fires are utilized as a management tool. There is a need to inventory fuel loading and ladder fuels next to private property or valuable resources to help identify specific projects and to prioritize them within the context of addressing the larger scale treatments that are developed. There are 10,243 acres of private land in the watershed. There are 1,235 acres in the analysis area. At least 15 homes or cabins are present with the boundary of the analysis area, most of which are occupied year-round.

Air Quality

Currently, prescribed burning and wildfires are temporary emission sources from the Forest that affect air quality. The Oregon Smoke Management Program directs the Forest Service to conduct prescribed burning under smoke dispersion conditions which minimize smoke impacts and protect air quality. Prescribed burning is done during times of air mass instability which allows the smoke to disperse into the upper atmosphere instead of being trapped near the ground where it can cause visibility and other problems. In order to burn during unstable conditions, most prescribed burning is

done in the spring as there are very few unstable days with the correct amount of fuel moisture in the fall.

Light southwest winds during the spring, summer and fall provide relatively clean, clear air in the Blue Mountains. The exclusion of fire from Blue Mountain ecosystem has helped create a condition that formerly had periods of when smoke was noticeably a part of the atmosphere. Now local residents have been accustomed to the clear air through most of the summer months. If prescribed fire is used to reduce the build up in fuels and restore ecosystem health, even a light amount of smoke, in recent years, has prompted calls from some residents complaining about smoke. When inversions at night trap smoke in valleys, there have been complaints about health problems occurring, and visibility on highways may become a concern. When large wildfires occur, the smoke impacts have been much greater than what has occurs with prescribed burning.

The nearest Class I Area for air quality that can be affected by burning in the watershed is the Strawberry Mountain Wilderness area. Air quality standards are to be met from July 1 through September 15 in Class I Areas. Predominately southwest winds tend to carry Forest smoke away from heavily populated areas like Boise, Idaho which is 200 miles to the east. Air quality effects have generally dispersed by the time they reach other Class I resides over the Eagle Cap Wilderness in Oregon or the Selway-Bitteroot Wilderness in Idaho.

Burning that might affect the town of John Day is to be done only after careful evaluation of meteorological conditions and potential impacts. Emissions limits have been established for the Blue Mountains which takes into account wildfire emissions. When the emissions limit is reached, no more burning is allowed for the year. In years with severe summer fire events fall burning may be curtailed because of this factor.

(See also page 17 ***ISSUE 1.4.9—Inadequate Amount of Treatment****, page 33;* ***ISSUE 1.4.10—Insufficient Pileated Woodpecker Habitat****, page 33;* ***ISSUE 1.4.11—Effects on Connectivity for*** Wildlife*, page 34;and* ***ISSUE 1.4.12—Effects of Managing Roadless*** Areas *page 34).*

3.2.6 WILDLIFE HABITAT

Threatened, Endangered or Sensitive (TES[58]) species, Management Indicator Species (MIS[59]), and Species of Interest (SOI[60]) utilize the analysis area. Habitats for these species developed with the fire adapted forests of the past. As forest conditions moved outside of their Historic Range of Variability (HRV), habitat conditions for these species were also altered. A combination of management activities, including timber harvest, road construction, grazing, and fire suppression, and natural disturbances, such as wildfire and windstorms have reduced some habitats below historic levels. Chapter 1, Section 1.2.1.6 Undesired Condition: Degraded Wildlife Habitat, page 18 highlighted losses in old growth habitat, dead wood habitat (large snags and down logs), grass and shrub forage and dispersal habitat for large, wide ranging carnivores. A more complete discussion of these topics follows.

This wildlife discussion first summarizes existing habitat conditions and needs for each TES species, MIS and SOI which use or may use the analysis area. TES species are addressed in Section 3.2.6.1, MIS in Section 3.2.6.2 and SOI in Section 3.2.6.3. Secondly, Section 3.2.6.4 summarizes the relationships between these wildlife species and each Forest type and structural stage (e.g. Dry Forest OFMS). Essentially, forest types and structural stages describe habitat types.

3.2.6.1—Threatened, Endangered, and Sensitive (TES) Species

A variety of Threatened, Endangered and Sensitive species occur and/or have potential habitat in the Southeast Galena analysis area. The *Land and Resource Management Plan* establishes management direction for TES species via Forest-wide standards (pages IV-30-IV-33). The gray wolf is listed as an endangered species. The Canada lynx and northern bald eagle are listed as threatened species. The peregrine flacon, Canada wolverine, Pacific fisher, bobolink, sandhill crane, long-billed curlew, tri-colored blackbird, Columbia spotted frog, western sage grouse, and gray flycatcher are considered sensitive species. These species are included on the Malheur National Forest list of Endangered, Threatened and Sensitive species (MNF 2000). Existing conditions for TES species are described in more detail in the Wildlife Biological Evaluation located in the Appendix of this document.

Gray Wolf *Canis lupis*

The gray wolf is listed as an endangered species. Wolves need large, remote areas relatively free from human disturbance (Snyder 1991). Forests, open meadows, rocky ridges, and lakes or rivers all comprise a pack's territory (Snyder 1991). Wolf' habitat preferences appear to be more prey dependent than cover dependent. Wolves prey mainly on large ungulates, such as deer and elk. In the West, wolves have been known to follow the seasonal elevation movements of deer and elk herds. Other prey species include various rodents, upland game birds and waterfowl, snowshoe hare, beaver, and black bear (Snyder 1991). Occasionally wolves prey on domestic livestock.

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58 Endangered Species: An animal or plant species listed under the Endangered Species Act that is in danger of extinction throughout all or a significant portion of its range.
Threatened Species: An animal or plant species listed under the Endangered Species Act that is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.
Sensitive Species: Species identified by a Forest Service regional forester for which species viability is a concern either a) because of significant current or predicted downward trends in population numbers or density, or b) because of significant current or predicted downward trends in habitat capability that would reduce a species' existing distribution.
59 Management Indicator Species (MIS): A species used to monitor the effects of planned management activities on viable populations of wildlife and fish, including those that are socially or economically important.
60 Species of Interest (SOI): A species of high public interest or demand.

Wolves excavate dens in well-drained soils in meadows near water, but occasionally they will den in hollow logs, under tree roots, rock outcrops, or even in beaver lodges (Snyder 1991).

Packs occupy, and defend from other packs and individual wolves, a territory of 20 to 214 square miles (*Federal Register*: July 13, 2000). Poisons, trapping, and shooting, spurred by federal, state, and local government bounties, resulted in its extirpation from more than 95 percent of its range in the 48 contiguous States.

Wolves are habitat generalists and potentially could occupy the entire Malheur National Forest. However, because of human persecution, seclusion is a very important factor in providing wolf habitat. Within the analysis area, the Vinegar Hill-Indian Rock Scenic Area and Dixie Butte Wildlife Emphasis Area provide areas relatively low in human impacts and disturbances.

Wolves are considered extirpated from Oregon. In 1999, one radio-collared, female wolf from the experimental Idaho population traveled through portions of the three Blue Mountain Forests. The female was trapped in the vicinity of the Upper Middle Fork Watershed and returned to Idaho. In 2000, a male wolf was killed on Interstate 84 near Baker City, Oregon. These incidents indicate that the Blue Mountains probably provide suitable habitat for wolves. Over time, wolves dispersing from the growing experimental, non-essential Idaho population could return to the Blue Mountains and establish breeding territories.

Canada Lynx *Lynx Canadensis*

The Canada lynx is listed as a threatened species. Habitat is primarily associated with high elevation, subalpine coniferous forests with a mix of age and structural classes (Ruediger et al., 2000). Lynx require late-successional forest for denning and protection and early successional forest for hunting.

The population density and distribution of lynx is closely tied to the population density and availability of prey species, primarily snowshoe hare (Ruggiero et al., 1994). Snowshoe hare seek dense, early successional conifer thickets to feed and escape predators and extreme cold during the winter months. In the spring, summer and fall, snowshoe hare are often associated with hardwood thickets and other area where herbaceous and woody forage is available. Lynx will also prey upon other species including squirrels, grouse, mice and other small mammals. Typical home range territories are 45-155 square miles (Ruggiero 1994). Home range size varies considerably and is usually dependent upon prey availability.

Lynx sightings are rare in Oregon. In the early 1990's, winter track and camera station surveys were conducted on the Malheur National Forest to inventory forest carnivores, but no lynx were detected. The District completed scratch pad surveys in 1999, 2000 and 2001. The 1999-2000 surveys did not determine lynx presence; 2001 data is still being analyzed. Recent unconfirmed lynx sightings have been reported along the Middle Fork of the John Day River, Blue Mountain Ranger District, and in the Reynolds Creek Subwatershed, Prairie City Ranger District.

Causes for population decline have been identified in the Lynx Conservation and Assessment Strategy (LCAS) (Ruediger et al., 2000), and include the following: habitat fragmentation or loss; direct mortality caused by starvation, motor vehicle accidents, or trapping; and increased human use of habitat areas such as in winter recreation areas. Timber harvest, road construction, fire suppression, winter recreation development, livestock grazing and wildfire have all contributed to degradation of habitat.

The analysis area is in the Southeast Galena Lynx Analysis Unit (LAU). Twenty-nine percent of this LAU (16,636 of the 58,352 acres) is classified as lynx habitat or potential lynx habitat. Habitat is concentrated in two areas. In the north, habitat is located in and around the Vinegar Hill-Indian Rock Scenic Area. In the south, habitat is located in and around the Dixie Butte Wildlife Emphasis Area.

In the Southeast Galena analysis area, twenty-eight percent of the analysis area (13,688 of the 49,473 acres) is classified as lynx habitat or potential habitat.

Generally, habitat is defined as stands above 5,000 feet that are in the cold, moist or Lodgepole Forest types. In the Dry Forest types, only the grand fir/grouse huckleberry plant association provides lynx habitat and only on north and east slopes above 5,000 feet and on south and west slopes above 5,650 feet. The elevation band is somewhat critical. A lynx's long legs and broad paws allow them to negotiate deep snow and effectively hunt snowshoe hare. Snow levels 2-4 deep or greater tend to limit access by other large carnivores that might compete with the lynx.

Stand structural stages, combined with tree canopy coverage, were used to further refine habitat data into denning, foraging, or unsuitable habitat, as defined by the LCAS. Table 100 displays lynx habitat classification within the Southeast Galena LAU and the Southeast Galena Analysis area.

Species Compositions and Successional Relationships—Cold Forest

Species compositions and structural characteristics of the cold forests were largely dependent upon the stage of succession of the stand and associated landscape as dictated by the time since the last major disturbance (namely high intensity fire). The conditions that affect disturbances in the cold forests have not changed substantially over time, resulting in little change in the fire severity from historic times to the present.

Lodgepole pine and whitebark pine are the primary seral species that would initially occupy a site. In stands with a longer fire-free interval, climax species such as subalpine fir and Engelmann spruce would become established. Stands with a short fire return interval were maintained in lodgepole pine, because succession was continually reset, never getting past the early seral stages. They are discussed in the preceding lodgepole pine section. Whitebark pine were also likely present in greater proportions since blister rust, an introduced disease, had not been established.

Table 100 Lynx habitat classification in Southeast Galena LAU and Southeast Galena Analysis Area--denning, foraging, unsuitable, and created unsuitable habitat by acres and percent of total lynx habitat.

Habitat Element	Existing Condition			
	Southeast Galena LAU		Southeast Galena Analysis Area	
	Acres	% Habitat	Acres	% Habitat
Denning	8,165	49%	6,608	48%
Forage	6,166	37%	5,739	42%
Unsuitable[1]	2,305	14%	1,341	10%
Created Unsuitable[2]	1,281[2]	8%[2]	639[2]	5%[2]
Total[3]	16,636[3]	100%[3]	13,688[3]	100%[3]

[1]*Unsuitable* = habitat made unsuitable by management activities, such as timber harvest, within the last *15* years *or* habitat made unsuitable by natural disturbances such as wildfire or wind throw regardless of when the disturbance occurred.

[2]*Created Unsuitable* = a subset of "unsuitable" and refers to lynx habitat made unsuitable by management activities within the last *10* years. The acres of "created unsuitable" habitat displayed above are included acres of "unsuitable" habitat as well.

[3]*Total acres* = denning + forage + unsuitable = 16,638 acres/13,688 acres. *Created unsuitable* acres are already included in *unsuitable* category and consequently, not double-counted.

Denning habitat typically occurs in stands classified as OFMS, YFMS or UR. The number of down logs for denning sites tends to be higher in these stands than in younger stands. Primary denning sites are often in large hollow logs, beneath windfall or upturned roots, or in brush piles in dense thickets (Brittell et al. 1989).

Foraging habitat occurs in many, but not all, stands classified as OFMS, YFMS, UR, and SI. OFMS and YFMS[61] stands, which represent more mature stand conditions, are likely to be optimal squirrel habitat. SI stands, i.e., early successional stands, dominated by dense young trees, provide habitat for snowshoe hares if trees are about 8 feet or taller. The highest quality habitat is in advanced regeneration units of lodgepole pine. SECC stands containing fairly dense pole-sized trees, provide some forage during the winter; however the forage is very limited.

Unsuitable habitat is created by management activities, such as timber harvest, or natural disturbances such as wildfire or windthrow. The 1994 Reed Fire and 1996 Summit Fire destroyed denning and foraging habitat in many areas. Many acres have been planted with conifers. Natural regeneration of lodgepole is high in some areas. Recent burns may stimulate woody browse production for use by snowshoe hares. Although many fire-killed trees were harvested, snag levels remain high. Snags will eventually fall, and may provide down wood for future lynx denning.

The 1998 Vincent/Vinegar windstorm blew down approximately 1,400 acres of mature trees. Rarely was blowdown 100% on any one acre. Quality denning conditions probably exist where blowdown was more moderate and overstory canopies remain intact. Extreme blowdown occurred on only 250 acres, and even on these acres smaller trees and advanced regeneration remain intact and are providing forage. On the 250 acres, the windstorm converted lynx denning habitat to forage habitat due to the reduction in canopy cover. The number of large trees on the ground would provide great opportunities for denning except that many of the concentrations are out in the open. Quality denning conditions probably only exist where log piles are located immediately adjacent to undamaged denning habitat at the periphery of the blowdown area. Log piles provide natal sites while adjacent canopy cover provides additional security.

In the Southeast Galena analysis area, lynx habitat is generally well distributed. Both the Lynx Analysis Unit (LAU) and the analysis area meet Lynx Conservation and Assessment Strategy LCAS standards.

Travel corridors provide security during movement from denning areas to foraging areas and during dispersal. Cover that is generally greater than 8 feet tall with stem densities in excess of 180 trees per acre allows for movement of lynx within their home ranges (Koehler 1990). Riparian corridors, forested ridges, and saddles appear to be favored travel ways. Connectivity for lynx is being provided via *Land and Resource Management Plan* Amendment 2 (LRMP2) corridors and a recommended 3-mile wide Key Linkage Area(KLAs). See Appendix E, Map 20—Wildlife Connectivity—For Action Alternatives.

Northern Bald Eagle *Haliaeetus leucocephalus*

The bald eagle is listed as a threatened species. Bald eagles prey largely on fish and, to a lesser extent, waterfowl and are usually associated with rivers or lakes. Habitat includes clean water with abundant fish and/or waterfowl populations, and many large, "wolfy" perch trees and roost sites nearby. In the Pacific Northwest, bald eagle nests are usually in multistoried, predominantly coniferous stands with old growth components near water bodies that support adequate food supply (U. S. Dept. Interior 1986). They usually nest in the same territories each year and often use the same nest repeatedly which can result in very large nest structures, 2-3 feet deep and up to 5 feet in diameter. Most nests in Oregon have been within 1/2 mile of water.

Eagles congregate at winter roost sites during the late fall, winter, and early spring. On the Malheur National Forest they scavenge in agricultural valleys and wetlands, feeding primarily on carrion normally found in areas of cattle concentration and birthing, or where ranchers dispose of dead animals. They roost at night in mature forest stands that provide a microclimate that helps protect them from cold weather and wind.

[61] See structure definitions page145.

Bald eagles have been sighted along the Middle Fork of the John Day River and probably forage there during the winter as long as carrion is present and available. In 2001, wildlife biologists identified the first suspected bald eagle nest to be located on the Blue Mountain Ranger District. The nest was identified along the Middle Fork of the John Day River, approximately 9 miles west, i.e., down river, of the Southeast Galena analysis area. It is believed the nest failed to fledge young. In the winter, bald eagles roost and feed in Bear Valley, along the South Fork John Day River, downstream on the Middle Fork John Day River, and the main John Day River. Temporary winter roosts are possible within the analysis area but none have been documented.

There are no bald eagles or critical habitat necessary for their recovery within the analysis area. According to the Pacific Bald Eagle Recovery Plan (USFWS 1986), key areas nearest the analysis area occur as winter roost sites along the John Day River.

American Peregrine Falcon *Falco peregrinus*

The peregrine falcon is a Region 6 sensitive species. Peregrine falcons prefer a variety of open habitats near nesting cliffs or mountains (Snyder 1991). They usually inhabit areas near water, such as lakes, rivers, or oceans. Nest sites are often used for several years. They tend to choose overhanging cliffs with loose soil, sand, dead vegetation, or gravel, in which they can scrape a depression for their eggs. Peregrine falcons primarily eat birds. Secondary prey species include tree and ground squirrels, rabbits, various other small mammals (Snyder 1991).

The peregrine falcon's most destructive predator is man. Peregrine falcon populations in the United Sates were dramatically reduced by exposure to chlorinated hydrocarbon pesticides. These pesticides reduce eggshell thickness, thereby causing the eggs to break during incubation. These pesticides are now banned in the United States and Canada. The peregrine falcon has made a dramatic comeback in the past decade.

Peregrine falcons have been observed in the Galena Watershed with most sightings occurring at Coyote Bluffs and Ragged Rocks. Coyote Bluffs is located within the analysis area on cliffs adjacent to the Middle Fork of the John Day River; cliff characteristics and close proximity to County Road 20 probably make this site low potential for nesting. Ragged Rocks is located approximately 3 miles west of the Southeast Galena analysis area; this site has been identified as having good potential for falcon nesting. Nesting peregrines have not been documented at either site. Nesting habitat also occurs about one mile north of the analysis area on the Umatilla National Forest; peregrines have been reported there, but nesting has not been documented.

California Wolverine *Gulo gulo*

The California wolverine is a Region 6 sensitive species. There is little information in the Blue Mountains relative to population density and distribution of wolverines. Research indicates that wolverines tend to prefer higher alpine areas with a mixture of habitats, including dense mixed conifer forest as well as shale/rock slide areas for both denning and foraging habitat (Ruggiero et al., 1994). In pre-settlement times, wolverines were widespread but it is likely this species presence always occurred at low densities in the western United States.

Wolverines are predominantly scavengers, especially in winter when their diets consist primarily of deer and elk (Ruggiero et al., 1994). In summer, they use a wider variety of foods including small mammals, birds, carrion and berries.

Home ranges of adult wolverine in North America are approximately 62 to 249 square miles for females, and approximately 124 to 995 square miles for males. Home range size may vary due to differences in abundance and distribution of food. Habitat is reduced or degraded, primarily due to forest fragmentation and high road densities.

Wolverine habitat within the southern Blue Mountains occurs primarily in wilderness and large roadless areas. Areas with low human impacts, low human disturbance, and high deer and elk concentrations are preferred. Within the analysis area, the Vinegar Hill-Indian Rock Scenic Area and Dixie Butte Wildlife Emphasis Area exhibit characteristics of wolverine habitat . Elsewhere on the District, the Strawberry Mountain Wilderness, Dry Cabin Wildlife Emphasis Area and the Shaketable, McClellan Mountain, and Aldrich Mountain Roadless Areas share the same characteristics.

Periodically throughout the 1990s, wolverine surveys were conducted across the District, including areas in and near the analysis area. No wolverine tracks or individuals were found. A wolverine was confirmed from bones and fur found in the Strawberry Mountain Wilderness in 1992. Unconfirmed sightings of wolverine were reported in the analysis area near Dixie Mountain and to the northwest near Big Boulder Creek. Additional sightings of animals and tracks have occurred on the District, but none have been confirmed.

It is likely that a wolverine could use the analysis area, particularly the large, unroaded areas associated with the Vinegar Hill-Indian Rock Scenic Area and Dixie Butte Wildlife Emphasis Area.

The Cold and Moist Forests represent the highest quality habitat, particularly where they remain relatively undeveloped and undisturbed. Quality habitat includes both the OFMS and YFMS structural stages. Approximately 13,500 acres of these forest types exist. Of that, 9,895 acres, or 73%, are in OFMS or YFMS condition. Structural stage percentages are within the estimated HRV for OFMS and in excess of the estimated HRV for YFMS.

Elsewhere, lesser quality habitat provides sufficient cover and security to meet landscape connectivity between potential home range areas.

Pacific fisher *Martes pennanti*

The Pacific fisher is a Region 6 sensitive species. Fisher are associated with mature and overmature stands in mixed conifer forests, especially those with complex physical structure near the ground (Buskirk and Powell 1994). Some hardwoods may be desirable for maximum prey numbers and diversity (Ruggiero 1994). A 70 to 80 percent canopy closure is believed optimum, but a California study showed a preference for 40 to 70 percent canopy cover areas. Fishers are medium sized carnivores that prey on a wide variety of foods including birds, rabbits, porcupines and carrion. Large diameter trees with cavities are important as denning sites. Dense forest stands in the latter successional stages provide the best quality habitat. Ruggiero et al. (1994) noted that fisher use riparian areas disproportionately more than their occurrence and exhibit a strong preference for habitats that have overhead tree cover. Movement and dispersal over the landscape is maintained by providing corridors with consistent overhead cover (Ruggerio et al. 1994).

Distribution is likely governed by the availability of food but the presence of overhead cover may also be an important factor. Home range sizes of fishers vary up to approximately 19 square miles for adult males. The range of one male will overlap those of more than one female.

The Moist Forest, Cold Forest and lodgepole pine forest represent the highest quality habitat for fisher based upon site capability. Quality habitat includes both the OFMS and YFMS structural stages. Approximately 14,600 acres of these forest types exist. Of that, 10,510 acres, or 72%, are in OFMS or YFMS condition. Structural stage percentages are within the estimated HRV for OFMS and in excess of the estimated HRV for YFMS.

The *warmer* Dry Forest environments likely provide fisher habitat as well, i.e., those plant associations with a notable grand fir component. Many of these stands have higher tree densities than they did historically. These conditions have resulted in the accumulation of dead wood habitat, both in the form of snags and down wood. These dead wood habitats, however, are generally smaller, and may provide a poorer quality of habitat. While fisher may use these areas for foraging,

and possibly denning, over all use is likely less when compared to Moist Forest, Cold Forest and lodgepole pine environments. In addition, these drier habitats tend to be more fragmented and degraded by timber harvest. Approximately 17,500 acres of dry grand fir plant associations exist. Of that, 9,915 acres, or 57%, are in OFMS or YFMS structure habitat. This percentage is excess of the estimated HRV of 10% to 30% for OFMS and YFMS in Dry Forests.

Although habitat exists in the analysis area, fisher are not known or suspected to occur there. Fisher have been extirpated from much of their range due to trapping and loss of habitat due to logging. They are considered extirpated from Oregon (Oregon Natural Heritage Program 2001).

Bobolink *Dolichonyx oryzivorus*

The Bobolink is a Region 6 sensitive species. Bobolinks are found in native and tame grasslands, haylands, lightly to moderately grazed pastures, no-till cropland, small-grain fields, wet meadows, and planted cover. Bobolinks prefer habitat with moderate to tall vegetation, moderate to dense vegetation, moderately deep litter, and without the presence of woody vegetation (Dechant et al., 2001). If habitat is not maintained, use by bobolinks declines significantly, possibly due to the accumulation of litter and encroachment of woody vegetation. Bobolinks respond positively to properly timed burning or mowing treatments, and moderate grazing.

Bobolinks are very local and scattered in the eastern one-third of Oregon and are known to breed on the Malheur National Wildlife Refuge, south end of Blitzen Valley, Harney County, Union County, and Wallowa County (Marshall 1996). Locally, sporadic nesting occurs in the Prairie City, Mt. Vernon, Silvies Valley, and Bear Valley areas (Sweeney, 2001; Winters 2001). In the Southeast Galena Analysis area, there has only been one reported sighting on the Middle Fork of the John Day River.

Bobolinks appear to prefer large grassland areas to small, requiring approximately 25-110 acres depending on habitat quality. Consequently, in Southeast Galena, habitat is likely limited to meadows and grasslands along the Middle Fork of the John Day River. About 615 acres of capable habitat exist, with the majority of the acres on private land. Many of these acres are grazed and may not be providing tall enough grass for bobolinks. Meadows exit in the uplands, but they tend to be small or habitat is naturally dry and low in productivity.

Sandhill Crane *Grus Canadensis* **and**
Long-billed curlew *Numenius americanus*

Both the sandhill crane and long-billed curlew are Region 6 sensitive species. Sandhill crane habitat includes large, undisturbed wetlands with vigorous wetland vegetation, such as sedges and cattails. Foraging habitat includes grains, seedlings and animal matter found in agricultural fields and large wetlands. Long-billed curlews construct nests on the ground in short vegetation, usually grasses and annual forbs, on rolling topography (Bicak et al. 1980). They also need areas of tall vegetation to provide hiding cover for chicks.

On the Malheur National Forest, these species have been seen at various locations, including Bear Valley and Logan Valley to the south and Phipps Meadow, Bridge Creek Meadow and Lobelia Meadow to the east. In the analysis area, cranes and curlews have been sighted along the Middle Fork of the John Day River, predominantly on private land. This area likely provides feeding habitat in the spring. None of the reported sightings along the Middle Fork confirmed nesting animals.

Tricolored blackbird *Agelaius tricolor*

The tricolored blackbird is a Region 6 sensitive species. Historically, tricolored blackbirds have been reported in dense, wet or dry tule marshes or patches of tules, cattails, or other emergent vegetation. More recently, the trend has been for more colonies to occur in blackberry thickets, and certain spiny grain crops such as wheat and barley (SJMSCP 2000). Nests are built of cattails, sedges, grasses, or other aquatic vegetation collected from the surface or in shallow water, and attached to cattails or

twigs in shrubs and blackberry thickets, usually near water. Feeding and roosting occurs in dense flocks, ranging from a few to 20,000 in a colony, throughout the year (USGS 1998). In winter, they move through marshes, open cultivated lands, and pastures. Food is gleaned from the ground and low vegetation, consisting of insects, spiders, and occasionally small tadpoles and snails (USGS 1998). Foraging areas have to be within a few miles of the nesting site (SJMSCP 2000).

In the Southeast Galena analysis area, habitat is considered limited. Habitat may be associated with the Middle Fork of the John Day River, but has not been confirmed. There are no known sightings on the Malheur National Forest (Sweeney, Hunt 2001, pers. comm.).

Columbia Spotted Frog *Rana luteiventris*

The spotted frog is a Region 6 sensitive species. Spotted frogs are highly aquatic and are rarely found far from permanent water. Breeding habitat is usually in shallow water in ponds or other quiet waters along streams. Breeding may also occur in flooded areas adjacent to streams and ponds. Adults may disperse overland in the spring and summer after breeding. Habitat has been degraded by past management activities, such as livestock grazing, road construction along streams, and timber harvest adjacent to streams, lakes ponds, springs, and marshes

The spotted frog is considered present in all subbasins on the Malheur National Forest. It is assumed this species is widely distributed in the analysis area. No habitat surveys have been conducted specifically for spotted frogs; however, habitat probably exists along most perennial and some intermittent streams. Fish surveys records incidental sightings of non-fish species. During 1996 fish surveys, spotted frogs were reported in the Davis/Placer subwatershed, along the Davis and Placer Creeks. .

Western sage grouse *Centrocercus urophasianus phaios*

The sage grouse is a Region 6 sensitive species. Sage grouse are residents of sagebrush habitat, usually inhabiting sagebrush-grassland or juniper (*Juniperus* spp.)-sagebrush-grassland communities. Meadows surrounded by sagebrush may be used as feeding grounds (Johnsgard 1973). Sage grouse use sagebrush of different age classes and stand structures as lekking, nesting, brooding, and wintering grounds. Neither expansive dense sagebrush nor expansive open areas constitute optimal sage grouse habitat. Sage grouse once occurred virtually everywhere there was sagebrush. Habitat loss, primarily due to overgrazing, sagebrush elimination, and land development, caused their decline (Hamerstrom and Hamerstrom 1961).

On the Malheur National Forest, sage grouse habitat is primarily associated with the larger expanses of sagebrush habitat located on the southern end of the Forest. In the Southeast Galena analysis area, sagebrush habitats and juniper/sagebrush habitats are very limited, probably providing marginal habitat at best. About 1,650 acres of dry shrublands and 1,400 acres of juniper woodlands could potentially support sage grouse.

Gray flycatcher *Empidonax wrightii*

The gray flycatcher is a Region 6 sensitive species. This species prefers relatively treeless areas with tall sagebrush, bitterbrush, or mountain mahogany communities, but is also associated with pinyon-juniper woodland with understory sagebrush, and open ponderosa pine forests (Csuti et al. 1997). This species in most abundant in extensive tracts of big sagebrush, often selecting areas along washes where the sagebrush is especially tall. In the western Great Basin, this species nests in tall big sagebrush shrublands (Ryser 1985).

About 1,400 acres of juniper woodlands, 1,450 acres of dry meadows and grasslands, 1,650 acres of dry shrublands, and 860 acres of moist meadows that could provide gray flycatcher habitat occur in the analysis area. All of these acres are not necessarily in a condition that will support this species. Quality sagebrush communities, for example, are relativity rare. Numerous mountain mahogany

stands and some bitterbrush occur as small inclusions in other forested habitat types. Because they are small, they were not mapped separately; therefore, acres for these types are not available.

3.2.6.2—Management Indicator Species(MIS)

To maintain viable populations of existing native and desired non-native vertebrate populations, the Malheur National Forest (under regulation 36 CFR 219.9) established a list of Management Indicator Species (MIS) that can be used to monitor the effects of planned management activities on viable populations of wildlife.

Selected MIS may reflect a mix of threatened, endangered, or sensitive species; species commonly hunted fished or trapped; non-game species of special interest; or species selected because their population changes are believed to indicate the effects of management activities on specified biological communities.

Once an MIS is designated, the Forest Service must evaluate the effects of recommended management activities in terms of both amount and quality of habitat and of animal population trend (36 CFR 219.19(a)(2)). The Forest Service need not conduct surveys to determine population levels of vertebrate species but can assume that maintenance of habitat is necessary to maintain a viable population sufficient to meet the regulatory requirements of NFMA (Inland Empire, 88F.3d).

In most cases formal surveys were not conducted in Southeast Galena to determine presence, but informal observations were used to determine presence whenever possible. If the presence of a certain species was not determined, based on one or more sightings, habitat suitability was used as a proxy to determine "probable presence." This assumes if the habitat is present, then the species is present and treats them as such.

3.2.6.2.1—MIS for Old Growth

Pileated woodpeckers, pine marten, three-toed woodpeckers and white-headed woodpeckers were selected as indicators of mature and old growth habitat. The Land and Resource Management Plan establishes management direction for old growth MIS via Forest-wide standards (page IV-32) and Management Area direction (pages IV-105 to IV-107). By providing habitat for these species, it is assumed that habitat for other old growth obligate species will be provided as well.

Pileated Woodpecker *Drycopus pileatus*

The pileated woodpecker is designated in the *Land and Resource Management Plan* as a Management Indicator Species (MIS) for old growth habitat, i.e., OFMS stand structure (see structural definitions page145)The species are also used as an indicator of dead and defective tree habitat. Pileated woodpeckers prefer to nest, roost, and (to a lesser extent) forage in mature or old growth forest with high canopy cover (Bull et al 1992, Bull 1980, Mellen et al 1992, Bull and Holthausen 1993). In northeastern Oregon, this species is associated with mature, multi-storied grand fir forests, but can also be found in ponderosa pine mixed conifer as well. Optimum habitat contains at least 4 large (> 20 inches dbh) snags/acre, plus at least 400 lineal feet of down logs to provide nesting, roosting and foraging sites (Bull and Holthausen 1993). Large dead trees, usually ponderosa pine or western larch, in excess of 20 inches dbh are necessary to accommodate a nesting cavity of significant size. A preference is shown for stands with canopy closures greater than 60 percent. Pileated woodpeckers forage mainly by excavating insects from snags and down logs in the summer, and scaling bark for insects in the winter. Forage habitat is most commonly found in grand fir forest types and consists of snags, usually greater than 20 inches dbh, logs larger than 25 inches in diameter, and live trees greater than 21 inches dbh used mostly for scaling.

Home range for a breeding pair has been identified by different sources as ranging from 300 acres (Thomas 1979) to 550 acres (Bull 1987) to 900 acres (Bull and Holthausen 1992). In a 900-acre home range, about 25% should be in OFMS, with the remainder in mid or old structural stages and half of the areas should have a canopy closure of at least 60% (Bull and Holthausen, 1993). The *Land and Resource Management Plan* recommends that a 600-acre habitat area (300-acre nesting area and 300-acre foraging area) be established to support each reproducing pair.

The Moist and Cold Forest environments represent the highest quality habitat for pileated woodpeckers based upon site capability. Approximately 13,500 acres of potential habitat exists. Of that 4,200 acres, or 31%, are in the old structure habitat conditions, preferred for nesting. Structural stage percentages are within the estimated HRV for OFMS. Canopy closure often exceeds 60%. Many stands likely meet the *Land and Resource Management Plan* standard for large snag density at 2.4 snags/acre greater than 21 inches diameter at breast height (dbh), but meeting this standard may or may not meet the optimum snag density standard of 4 snags/acre greater than 21 inches. Densities for smaller snags, 12" to 21" dbh, are relatively higher. The YFMS structural stage (see definition page 145)) at 5,625 acres, or 42% of the moist and Cold Forests, is considered poorer quality habitat that is often deficient in large tree structure, dead wood habitats and /or canopy cover. These habitats likely meet some of the feeding needs of the pileated woodpecker, as well as some nesting trees. However, because of the less than ideal condition of these habitats, it is likely that larger home ranges are required to meet the species habitat needs. Structural stage percentages are in excess of the estimated Historical Range of Variability (HRV see definition, page 6) for YFMS.

The *warmer* Dry Forest environments likely provide pileated woodpecker habitat as well, i.e., those plant associations with a notable grand fir component. However, snag and down wood densities tend to be lower or deficient, often not meeting *Land and Resource Management Plan* standards of 2.4 snags/acre > 21" dbh. Despite these deficiencies, these habitats still likely provide for some of the species needs, particularly foraging habitat. Pileated woodpeckers likely persist in these habitats, although at reduced densities and poorer distributions. Approximately 17,500 acres of dry grand fir plant associations exist. Of that, 2,435 acres, or 14%, are in OFMS structure habitat. This percentage is within the estimated HRV of 5% to 15% for OFMS in Dry Forests. About 7,480 acres, or 43%, are in YFMS structure habitat. This percentage is in excess of the estimated HRV of 5% to 15% for YFMS in Dry Forests. A century of fire suppression has probably improved some of these forest types for pileated woodpeckers, permitting understory fir to establish and increasing canopy closure and stand complexity.

Land and Resource Management Plan, Management Area 13 (MA-13) provides for the management of old growth habitat through a system of Dedicated Old Growth (DOG) units. DOGs were delineated Forest-wide to provide an even distribution of habitat areas, one DOG every 12,000 acres, or approximately 5 miles apart (see Appendix E, Map 19 Dedicated and Replacement Old Growth for Action Alternatives). The *Land and Resource Management Plan* assumes that that this system of DOGs will provide for species viability. Five DOGs have been delineated for pileated woodpeckers within the analysis area (see Dedicated Old Growth and Connectivity, page 178). To meet the 12,000-acre distribution requirement, DOG locations do not always correspond with the highest quality habitat. DOG's 330 and 332 are on moist sites, representing the highest quality habitat. DOG's 129, 333 and 433 are predominantly in the drier grand fir sites, representing lesser habitat. Currently, DOGs and associated feeding areas may not meet the 600-acre size requirement specified in the *Land and Resource Management Plan* (see Dedicated Old Growth and Connectivity, page 178).

Four relatively large, contiguous blocks of OFMS exist, ranging in size from 600 acres to 1,700 acres. As distributed, and only considering the highest quality habitat (OFMS in cold and Moist Forest types), the analysis area supports home ranges for six reproducing pairs of pileated

woodpeckers, based on a 600-acre home range as directed in the *Land and Resource Management Plan*. Consequently, despite the habitat quality and size of the five DOGs, the analysis area could support at least six reproducing pairs. When this quality habitat is combined with somewhat lower quality habitat, the analysis area likely supports additional reproducing pairs. The analysis area would provide for species viability.

Pine Marten *Martes americana*

The pine marten is designated in the *Land and Resource Management Plan* as a MIS for old-growth habitat, i.e., OFMS. Marten are associated with mature and overmature stands in moist coniferous forests, especially those with complex physical structure near the ground (Buskirk and Powell 1994). These animals generally prefer complex stands associated with lodgepole pine as home range habitat (Fager 1991) with heavier use near riparian areas (Spencer and Zielinski 1983). Martens show a strong avoidance of open areas, probably as a response to predator avoidance (Hawley and Newbry 1957). Prey species are influenced by seasonal availability and are composed mainly of voles, tree squirrels and ground squirrels. Complex lower stand structure (i.e. lower branches, boles, stumps, logs, and shrubs) provides resting sites, subnivean (below snow) access for winter foraging, and cover from predators. A variety of structures are used for denning, primarily trees, logs, and rocks. Dry Forest types and those that lack structure near the ground are used very little (Buskirk and Powell 1994). Movement and dispersal over the landscape is maintained by providing corridors with consistent overhead cover (Ruggerio et al. 1994).

The home range of pine marten are much larger than would be expected for a carnivore of this size (Ruggiero et al., 1994). Territory size for pine martens was found to vary from 103 acres in the fall when prey is abundant to 618 acres in the spring when prey is scarce. Some biologist's (Freel, 1991) have recommended a home range size of 1,400 acres for a reproducing pair of marten. Home range size may be larger in fragmented forests than they would be where large, contiguous blocks of old growth exist (Soutierre 1979, Thompson and Colgan 1987). The *Land and Resource Management Plan* recommends that a 160-acre home range be established to support each breeding female.

Habitat classification within the analysis area is similar to that described for pileated woodpeckers; however, marten do not exhibit as strong a need for larger diameter trees as pileated woodpeckers. The Moist Forest, Cold Forest and lodgepole pine forest represent the highest quality habitat for pine marten based upon site capability. Because large diameter trees are not as critical for pine marten viability, quality habitat includes both the OFMS and YFMS structural stages. Approximately 14,600 acres of these forest types exist. Of that, 10,510 acres, or 72%, are in OFMS or YFMS condition. Structural stage percentages are within the estimated HRV for OFMS and in excess of the estimated HRV for YFMS.

The *warmer* Dry Forest environments likely provide pine marten habitat as well, i.e., those plant associations with a notable grand fir component. District biologists have reported sightings of martens in these habitats. Many of these stands have higher tree densities than they did historically. These conditions have resulted in the accumulation of dead wood habitat, both in the form of snags and down wood. These dead wood habitats, however, are generally smaller, and may provide a poorer quality of habitat. While pine marten may use these areas for foraging, and possibly denning, over all use is likely less when compared to Moist Forest, Cold Forest and lodgepole pine environments. In addition, these drier habitats tend to be more fragmented and degraded by timber harvest than other forest types. Approximately 17,500 acres of dry grand fir plant associations exist. Of that, 9,915 acres, or 57%, are in OFMS or YFMS structure habitat. This percentage is excess of the estimated HRV of 10% to 30% for OFMS and YFMS in Dry Forests. Pine martens likely persist in these habitats, although at reduced densities and poorer distributions. Individuals using these areas likely require larger home ranges to make up for the poorer quality habitat.

The most important prey of marten- various vole species - is highly associated with dense herbaceous and riparian habitats. Although riparian shrubs are generally in an upward trend, it is suspected that species composition, distribution and vigor are lower than potential throughout much of the watershed. In some areas, shrubs are old and decadent and not reproducing well. Fire suppression, conifer encroachment, stream channel and floodplain modification along with big game and livestock browsing continue to limit recovery of hardwoods from their historic levels. These conditions have reduced the suitability of foraging habitat for marten.

Eleven Dedicated Old Growth (DOG) units have been delineated for pine martens within the analysis area (see Dedicated Old Growth and Connectivity, page 178). DOGs were delineated to provide an even distribution of habitat areas, one DOG every 4,000 to 5,000 acres, or approximately 3 miles apart (see Appendix E, Map 19 Dedicated and Replacement Old Growth for Action Alternatives). The *Land and Resource Management Plan* assumes that that this system of DOGs will provide for species viability. As with pileated woodpeckers, DOG locations may not always correspond with the highest quality habitat. DOG's 242, 243, 245, 249,250, and 252 are in Moist Forests, representing the highest quality habitat. DOG's 248, 333 and 533 are predominantly in the drier grand fir sites, representing lesser habitat. Currently, DOGs may not meet *Land and Resource Management Plan* size requirements for a breeding female (see Dedicated Old Growth and Connectivity, page 178).

Habitat is plentiful. Even if one considers only the highest quality habitat (10,510 acres of OFMS and YFMS in the Moist, Cold and Lodgepole types), large contiguous blocks of habitat are available. The pileated woodpecker section highlights four large contiguous blocks of OFMS; the inclusion of adjacent YFMS as habitat greatly expands the size of these blocks. The analysis area could support as many as 65 territories for pine marten based on a 160-acre home range as directed in the *Land and Resource Management Plan*. Consequently, regardless of the size and habitat quality of the eleven DOGs, the analysis area could support well over eleven territories. When this quality habitat is combined with somewhat lower quality habitat, the analysis area likely supports additional territories. The analysis area would provide for species viability.

Three-toed Woodpecker *Picoides tridactylus*

The three-toed woodpecker is designated in the *Land and Resource Management Plan* as a MIS for old growth lodgepole pine. The species is also used as an indicator of dead and defective tree habitat. The species prefers stands where lodgepole pine is either dominant or co-dominant, and uses mostly trees 9" dbh and greater for both nesting and foraging (Bull 1980, Goggins 1986). Suitable habitat is tied to existing levels of diseased and decaying trees with heart rot for nesting and roosting, as well as decaying substrate to provide a prey base for wood-boring insects (Goggins et al. 1987). The species forages by scaling and pecking in trees with scaly bark, which include lodgepole pine, Engelmann spruce and western larch. In particular, three-toed woodpeckers are attracted to areas with high concentrations of beetles, such as habitats created by stand replacing burns or blowdown. Habitat is believed to overlap with that of black-backed woodpeckers, although the three-toed woodpecker has a slightly more northern and higher elevation distribution, and tends to feed more exclusively in lodgepole pine-dominated stands (Marshall 1992).

Home range varies from 130 to 750 acres. Goggins (1987) recommends that Management Areas for each pair of three-toed woodpeckers should be 528 acres of mixed conifer or lodgepole pine forest in mature and overmature condition and at an elevation of 4,500 feet or higher. *Land and Resource Management Plan* standard 59 gives direction to identify potential or existing old growth lodgepole pine habitat for 3-toed woodpeckers to assure species viability. Minimum management requirements suggest establishing habitat areas of 75 acres for every 2,000 to 2,500 acres (UDA 1986).

The Lodgepole Pine Forest, Moist Forest and Cold Forest types represent the highest quality habitat for three-toed woodpeckers. Approximately 14,600 acres of potential

habitat exists. Of that 4,450 acres, or 30%, are in the old structure habitat conditions, preferred for nesting and foraging. The OFMS structural stage is within the estimated HRV.

In the Granite Boulder Subwatershed, there are three larger blocks of climax lodgepole, ranging from 120 acres in size to 190 acres in size. These blocks are located at high elevations in the Vinegar Hill – Indian Rock Scenic Area. Several stands classify as old-growth lodgepole. Stands have a sufficient level of snags and down woody debris for foraging and lodgepole pine trees for nesting. Adjacent stands, lacking in lodgepole pine, may still provide secondary habitat. Habitat appears suitable for three-toed woodpeckers, and possibly, for black-backed woodpeckers as well. DOGs for three-toed woodpeckers have not been established in these areas, but habitat is protected because of its inclusion in the scenic area. The 1994 Reed Fire, the 1996 Summit Fire and the 1998 Vincent/Vinegar windstorm probably provided the elevated beetle habitat this species prefers. The period when burns and beetle-infested stands are useful for foraging is limited to 3 to 5 years, because beetles no longer use snags after they have dried out (Bull 1980).

White-headed woodpecker *Picoides albolarvatus*

White-headed woodpeckers are highly associated with Old Forest Single Strata (OFSS) stands, i.e., open canopy stands of large mature and overmature ponderosa pine, and less frequently mixed ponderosa pine and Douglas-fir stands (Burleigh 1972, Ligon 1973, Webber and Cannings 1976). This species is also used as an indicator of dead and defective tree habitat. Forage items vary by season, with ponderosa pine seeds comprising the diet in fall and winter, and insects on tree surfaces used throughout the year when available (Morrison and With 1987). Nests are commonly excavated in ponderosa pine snags with diameters greater than 23 inches (Frederick and Moore 1991). Home range size varies from 250 to 500 acres with an average of 350 acres.

Habitat abundance and distribution for white-headed woodpeckers has been reduced/eliminated in the Dry Forest types. Past harvest activities have concentrated on removing the large overstory ponderosa pine, western larch and Douglas-fir trees and snags, setting many stands back to younger structural stages. Significant reduction in numbers of large, mature ponderosa pine reduces trees for nesting and cones for winter food supplies. In other areas, fire suppression has permitted increased stocking of understory trees, often shifting stand structure from OFSS to OFMS. Stand densities have increased since the 1940's to the detriment of white-headed woodpeckers, which prefer more open understory structure. Research in central Oregon found that white-headed woodpecker home range sizes were up to four times larger in multi-storied, fragmented areas with multiple silvicultural treatments as compared to larger, contiguous tracts of ponderosa pine that still exhibited old-growth characteristics.

Potential habitat for white-headed woodpeckers is most often associated with the Dry Forest types. Approximately 29,000 acres of potential habitat exists. Today, 290 acres, or 1%, of these forest types are classified as OFSS. Historically, 30 to 55% of the Dry Forest types were in stands of OFSS. OFMS stands are probably providing habitat for OFSS associated species to a degree, as long as canopy cover is not too great, and appropriate tree species composition exists, i.e., predominantly ponderosa pine, Douglas-fir and western larch. However, habitat suitability may not be high, and will continue to decline as stands continue to increase in tree density and proportion dominated by true firs. It is unlikely that these habitats would provide for viable densities and distribution of the species across the analysis area. There are currently 3,480 acres, or 12% of these forest types, in OFMS that are probably providing habitat for OFSS associated species.

The Moist Forest types likely supported OFSS stands, but at a much lower level than the Dry Forest types. Approximately 11,500 acres of Moist Forest types exist. Today, 570 acres, or 5% of these forest types, are classified as OFSS. Historically, 5 to 15% of these types are believed to have been OFSS.

In the Granite Boulder Subwatershed, a 500-acre contiguous block of OFSS exists. In 1994, the Reed Fire burned through this area, killing the understory trees, while preserving most of the large overstory trees. Other blocks of OFSS exist, ranging in size from 10 to 80 acres in size.

Because of the lack of mature, open-grown ponderosa pine habitat, it is questionable as to whether the existing habitat is providing for population viability of white-headed woodpeckers.

Dedicated Old Growth and Connectivity

Land and Resource Management Plan, Management Area 13 (MA-13) provides for the management of old growth habitat through a system of dedicated old growth (DOG) units and replacement old growth (ROG) units (see Appendix E, Map 19 Dedicated and Replacement Old Growth for Action Alternatives). Habitat is to be composed of mature/overmature sawtimber (150 years or older). The goal of MA-13 is to provide suitable habitat for old growth dependent wildlife species, ecosystem diversity, and preservation of aesthetic qualities. Three MIS, as discussed previously, are used as indicators of the amount and quality of old-growth habitat: pileated woodpecker, pine marten and three-toed woodpecker. Pileated woodpecker and pine marten are used as indicators for OFMS habitat. Three–toed woodpeckers are used as an indicator for OFMS lodgepole pine. The white-headed woodpecker, although not specifically raised as a MIS for old-growth in the *Land and Resource Management Plan*, is recognized as a good indicator of OFSS habitat. Replacement old growth (ROG) areas are established to counter possible catastrophic damage or deterioration of the DOGs.

The *Land and Resource Management Plan* directs that pileated woodpecker areas are to be 600 acres, composed of a 300-acre DOG and a 300-acre feeding area(PWFA). ROGs are intended to be ½ the size of DOGs, i.e., 150 acres for pileated woodpecker DOGS. ROGs may overlap with the feeding areas. Pine marten units are to be 240 acres, composed of a 160-acre DOG and an 80-acre ROG. Again, ROGs are intended to be ½ the size of their corresponding DOG. DOGs managed for both species should be managed at the 600-acre home range recommended for pileated woodpeckers. Management requirements are derived from the US Forest Service 1986 Minimum Management Requirements.

In Southeast Galena, thirteen DOG units have been delineated for pileated woodpecker, pine marten, or a combination of both species, totaling 3,099 acres. Table 101 shows species designation and acres for each DOG unit. No DOG units have been established for three-toed woodpeckers. There is no specific provision in the *Land and Resource Management Plan* to identify management areas for white-headed woodpecker. Existing DOGs do not always meet minimum size requirements, and they are not always tied to logical stand or topographical boundaries.

ROGs have not been established for 11 out of 13 DOGs. Pileated feeding areas have not been established for 4 out of 5 pileated woodpecker DOGs. Table 101 displays existing ROG and feeding area acres.

Table 101 Dedicated Old Growth (DOGs) and Replacement Old Growth (ROGs) Units

DOG #	Old Growth Management Area (MA-13) Species	Minimum MA-13 Acre Requirements	Existing DOG Acres	Existing ROG Acres	Total Existing Acres
DOG 129	Pileated Woodpecker	600	397	0	397
DOG 242	Pine Marten	240	249	47	296
DOG 243	Pine Marten	240	204	0	204
DOG 245	Pine Marten	240	214	0	214
DOG 248	Pine Marten	240	149	0	149
DOG 249	Pine Marten	240	168	0	168
DOG 250	Pine Marten	240	169	0	169
DOG 252	Pine Marten	240	153	0	153
DOG 330	Woodpecker and Marten	600	340	0	340
DOG 332	Woodpecker and Marten	600	302	0	302
DOG 333	Woodpecker and Marten	600	366	134	500
DOG 433	Pileated Woodpecker	600	171	0	171
DOG 533	Pine Marten	240	217	0	217
TOTALS		4,920	3,099	181	3,280

[1] **Old-growth Management Area (MA-13) Minimum Management Requirements:**
Pileated Woodpecker Areas = 300-acre DOG + 300-acre feeding area = *600 acres*. ROGs = 150-acres and overlap with feeding areas.
Pine Marten = 160-acre DOG + 80-acre ROG = *240 acres*

Approximately 2,035 acres or 66% of the 3,099 acres located within the DOGs/ROGs currently classify as OFMS. Most of the remaining acres classify as YFMS (young forest multiple strata). These latter acres typically provide adequate canopy complexity and canopy closure, but the number of large diameter trees present fall short of quantities required for OFMS classification.

DOG/ROG locations may not always correspond with the highest quality habitat. DOGs 242, 243, 245, 249, 250, 252, 330 and 332 are in Moist Forests, representing the highest quality habitat. DOGs 129, 248, 333, 433, and 533 are predominantly in the drier grand fir sites, representing lesser habitat. ROG 242 is in Moist Forest; ROG 333 is in Dry Forest.

Forested areas located outside designated DOGs, ROGs and feeding areas can provide additional habitat for pileated woodpeckers and pine martens. The analysis area currently contains approximately 7,900 acres of OFMS and 900 acres of OFSS. See previous habitat descriptions for pileated woodpeckers and pine martens

In the Southeast Galena Watershed, OFSS habitat on the Dry Forest types is well below the historic range of variability due to timber harvest and fire suppression activities. Stands that were historically OFSS are now overly stocked with smaller diameter trees. Many of these stands now classify as OFMS. Risk of uncharacteristically severe wildfire is elevated. Insect and disease risk is elevated. Old growth conditions may not be sustainable.

Regional Forester's *Land and Resource Management Plan* Amendment 2 requires that connectivity corridors be established between late and old structure stands. Within corridors, canopy closure is to be within the top 1/3 of site potential and medium or larger diameter trees are to be common. Standards require that corridors be at least 400 feet wide. Hereafter, these corridors will be referred to as *Land and Resource Management Plan* Amendment 2 corridors or LRMP2 corridors. LRMP2

corridors provide dispersal and migratory habitats for a variety of wildlife, including bird species, large wild ungulates, small mammals and wide-ranging carnivores such as the lynx, wolverine and pine marten.

All late and old structure stands and existing DOGs/ROGs have been identified and connectivity corridors delineated (see Appendix E, Map 20—Wildlife Connectivity—For Action Alternatives). Quality of this habitat varies depending on forest type, stand structure, plant association, and canopy closure. Late and old habitats, including DOGs/ROGs, are generally well connected, and the designated corridors meet Land and Resource Management Plan Amendment 2 standards. Some of the corridor habitat, however, is in a less ideal condition as it lacks some of the ground level structure important for providing quality habitat. Stem exclusion open and closed canopy (SEOC, SECC see photos page 146) stand structures are examples. In addition, breaks in connective corridors occur in some areas as the result of past regeneration harvest, insect and disease outbreaks, and natural openings.

3.2.6.2.2—MIS—Primary Cavity Excavators (PCE)

Eleven species were selected as Management Indicator Species (MIS) of dead and defective tree habitat because they create their own nesting cavities in dead or detective trees. The *Land and Resource Management Plan* establishes management direction for PCEs via Forest-wide standards (pages IV-29 to IV-30), as amended. By providing habitat for these woodpeckers, habitat is provided for many other cavity dependent species. Species associated with dead wood habitats include the pileated woodpecker, three-toed woodpecker, white-headed woodpecker, black-backed woodpecker, Lewis' woodpecker, Williamson's sapsucker, red-naped sapsucker, red-breasted sapsucker, hairy woodpecker, downy woodpecker, and northern flicker. Three species serve as MIS for both old growth and primary cavity excavators (see 3.2.6.2.1—MIS for Old Growth, page 173). Habitats for the pileated wood pecker the three-toed woodpecker and the white-headed woodpecker were described in the previous section. The remainder of PCEs are described below.

Black-backed Woodpecker *Picoides arctus*

Black-backed woodpeckers are associated with lodgepole pine, ponderosa pine, or mixed forests containing lodgepole and ponderosa pine and other conifers such as larch, true fir, and Engelmann spruce (Marshall, 1992). A study on the Deschutes National Forest showed their preference for mature and overmature lodgepole pine stands over younger stands or logged areas. All the nests were in heart rot infected lodgepole pine, with an average diameter of 11" dbh. A study on the Starkey Experimental Forest showed that over half of the nests were in ponderosa pine, with the other half being in lodgepole and larch. Cankers, mistletoe clumps, and other deformities in mature and overmature lodgepole are important for providing roosts. Concentrations of birds occur in stands where wind, fire, or insect-killed timber supports bark beetles above normal levels (Marshall, 1992). This species is anatomically and morphologically adapted more than other woodpeckers for drilling and pecking because it can deliver stronger blows by striking from a greater distance than other woodpeckers. Consequently, it prefers to nest in smaller trees (<20" dbh, averaging about 12"dbh), recently dead and therefore, harder snags (Bull 1980, Marshall 1992a, Saab and Dudley 1997). Black-backed woodpeckers usually forage by drilling and scaling, or flaking, the bark of trees to reach insects (Bull 1980, Raphael and White 1984). Scaling is most easily accomplished on smaller diameter trees that have thinner bark, which also explains why black-backs are attracted to smaller diameter trees. Habitat is believed to overlap with that of three-toed woodpeckers, although the black-backed woodpecker tends towards slightly lower elevations and a mix of conifer species rather than the pure lodegpole dominated stands preferred by three-toed woodpeckers (Marshall 1992).

Home ranges on the Deschutes study varied form 180 to 810 acres with an average of 430 acres. Goggins (1987) recommends Management Areas for each pair of black-backed woodpeckers should be 956 acres of lodgepole pine or lodgepole pine dominated mixed conifer forest in mature and overmature condition, with some areas at elevations less than 4,500 feet elevation. There is no specific provision in the *Land and Resource Management Plan* to identify blocks of habitat for the black-backed woodpecker.

The lodgepole pine forest, Moist Forest and Cold Forest represent the highest quality habitat for three-toed woodpeckers. Approximately 14,600 acres of potential habitat exists. In the Moist and Cold Forest types, black-backed woodpeckers are more strongly associated with the OFMS structural stage. In the Lodgepole Forest types, black-backed woodpeckers will use OFMS, YFMS and UR structural stages. Consequently, quality habitat is currently provided on 5,145 acres, or 35% of potential habitat. The OFMS structural stage is within the estimated HRV; the YFMS and UR structural stages are in excess of HRV.

Grand fir/grouse huckleberry sites in the Dry Forests may also provide habitat. These forest stands often are a mix of conifer species, including ponderosa pine and lodgepole pine. Species composition is fairly variable, and is strongly influenced by elevation, aspect and topography. Lodgepole pine is often restricted to cold sites located in the riparian bottoms. In Southeast Galena, grand fir/grouse huckleberry sites occupy about 6,900 acres with 1,080 acres in a OFMS condition. These sites have not been specifically surveyed for their potential as black-backed woodpecker habitat, and it is uncertain whether sufficient levels of lodgepole pine exist.

The previous three-toed woodpecker description describes the larger blocks of lodgepole pine that occur in the analysis area. To date, there are no survey techniques to determine presence because the birds do not respond to tape-recorded calls like other birds such as goshawks and pileated woodpeckers.

Lewis' Woodpecker *Melanerpes lewis*

The Lewis' woodpecker is used as an indicator of dead and defective tree habitat. Unlike most other woodpecker species in Oregon, Lewis' woodpecker is an aerial insectivore and requires openings for foraging maneuvers. Preferred nesting habitat consists of two distinct types in eastern Oregon: riparian areas with large cottonwoods, and burned over ponderosa pine forests. This species seldom excavates its own nest cavity, instead using cavities created by other woodpeckers (Bock 1970). In burned areas, ponderosa pine snags greater than 16 inches dbh are chosen for nesting. Similar diameter cottonwood snags in riparian areas are selected (Galen 1989). Excluding burned coniferous forest and riparian habitat, the greatest concentration of Lewis' woodpecker source habitats was in ponderosa pine forests in the OFSS structural stage (Wisdom et al., 2000).

Cottonwood habitat is sparse throughout the analysis area, restricted to riparian areas. Scattered individual and groups of individuals are located along the Middle Fork of John Day River and along several of its tributary streams. Numbers of cottonwood are low and declining. Areas burned in the 1996 Summit Fire and 1994 Reed Fire have a high density of large diameter snags. Although much of the fire areas were salvage harvested, snag mitigation required the retention of snags in excess of the 2.4 snags/acre required by the *Land and Resource Management Plan*. Approximately 1,300 acres burned by wildfire is within the Southeast Galena analysis area. Habitat is limited, except in the fire areas.

As previously described for white-headed woodpeckers, 29,000 acres of Dry Forest provides potential habitat for Lewis' woodpecker. Today, only 290 acres, or 1%, of these forest types are classified as OFSS. Reductions in OFSS have reduced forest patch openings that allowed foraging maneuvers. Multi-storied forests have reduced understory shrubs and presumably reduced the abundance of associated arthropods on which Lewis' woodpeckers feed.

Williamson's Sapsucker *Sphyrapicus thyroides*

In northeastern Oregon, Williamson's sapsuckers prefer mature and old growth mixed conifer forests at 3,500 - 6,500 feet elevations (Bull et al., 1986). The species also uses riparian habitats to an extent (Conway and Martin 1993, Raphael and White 1984). Nesting occurs in large diameter trees (generally >20" dbh), both live and dead, and comprised mainly of western larch, but also ponderosa pine, Douglas-fir, and grand fir (Bull 1980, Raphael and White 1984). Although all forest types contained this species, 53% of nesting occurred in grand fir types. This species feeds by gleaning insects, drilling for insects and sapsucking (Bull 1980, Raphael and White 1984). References to home range size were not found in the literature.

The Moist and Dry Forest environments represent the highest quality habitat for Williamson's sapsuckers. Approximately 40,500 acres of potential habitat exists. Of that 7,390 acres, or 18%, are in the old structure habitat conditions, preferred for nesting. Structural stage percentages are within the estimated HRV for OFMS. In the Moist Forests, dead wood habitats are sufficient. In the Dry Forests, dead wood habitats are deficient.

Riparian hardwood habitats have declined over time. Aspen habitats are a minor component of the landscape, comprising 25 identified sites on 28 acres. These stands are generally decadent, heavily encroached by conifers, declining in health and vigor, and over-browsed by big game and livestock. Cottonwood habitats are in similar condition to aspen habitats. Riparian habitat conditions for sapsuckers are likely poor.

Red-naped Sapsucker *Sphyrapicus nuchalis*

Red-naped sapsuckers were formerly a subspecies of yellow-bellied sapsuckers. Late/old aspens clones are the preferred habitat. They are found in forests containing pure stands of aspen or mixed stands of aspens and conifers (Jackman 1974). They may also use riparian willow communities for foraging (Csuti 1997). Nest trees are most commonly aspen with heart rot, but ponderosa pine is also selected (DeGraaf 1991). This species feeds by sapsucking, flycatching, gleaning and pecking. Suitable habitat has declined over time. Conifer and riparian habitats are similar to those described for Williamson's sapsucker.

Hairy Woodpecker *Picoides villosus*

Suitable habitat for the hairy woodpecker includes open stands with low basal areas along ridges, low slopes, and southerly aspects in the ponderosa pine forest types. It is more common in older forests, but readily uses burned areas and forest edges for foraging (Csuti 1997). In northeastern Oregon, nesting occurs primarily in ponderosa pine 10-20 inches dbh. Grand fir trees are not selected, but other species may be used (Bull et al. 1986). Hairy woodpeckers feed mostly in ponderosa pine stands, and will use grand fir stand types as well. Both live and dead trees greater than 10 inches dbh serve as forage habitat.

Hairy woodpeckers are considered habitat generalists, i.e., they are less restricted by habitat conditions than other woodpecker species. Although the hairy woodpecker has preferences for certain tree species for nesting and foraging, it has been observed in almost all forest types in the analysis area as long as an adequate amount of dead wood habitat is available. Habitat is well distributed throughout the analysis area. However, low snag densities in the Dry Forests may inhibit occupation in these areas.

Downy Woodpecker *Picoides pubescens*

Preferred habitat for the downy woodpecker includes cottonwood and aspen stands as well as riparian areas, but they will use coniferous-deciduous and sometimes coniferous forests. Nesting occurs in trees and snags greater than 6 inches dbh at heights over 15 feet (Thomas 1979). They forage by a variety of means such as pecking and flaking bark for insects, gleaning leaves, and flycatching (Csuti 1997).

Potential habitat for this species is currently found in existing riparian areas and to a more limited extent in aspen stands in the planning area. As discussed for the Lewis' woodpecker and the sapsuckers, aspens and cottonwoods are at very low levels throughout the analysis area. In addition, this species may be relegated to breeding at lower elevations (Csuti 1997), and may not breed in the elevations existing in Southeast Galena.

Northern Flicker *Colaptes auratus*

The northern flicker is used as an indicator of dead and defective tree habitat. The species is most often associated with open forests (Jackman 1975). In northeastern Oregon, historic habitat may have been most often associated with open park-like stands of ponderosa pine for nest sites adjacent to grasslands where the birds foraged (Bull 1986). The birds commonly nest in broken-topped pine snags greater than 20 inches dbh. Tree canopy closures are generally less than 35%. Herbaceous ground cover is generally high because of the lack of canopy closure. Northern flickers spend most of their time foraging for ants on the ground and less time excavating, pecking, gleaning, and seed harvesting in live and dead trees, downed logs and stumps.

Northern flickers, like hairy woodpeckers, are considered habitat generalists, i.e., they are less restricted by habitat conditions than other woodpecker species. Although the flicker has preferences for certain tree species for nesting and foraging, it has been observed in almost all forest types. Habitat is well distributed throughout the analysis area.

3.2.6.2.3—MIS—Rocky Mountain Elk

Rocky Mountain Elk *Cervus elaphus*

Rocky Mountain Elk were selected as a Management Indicator Species (MIS) due to their economic and social value, and their response to changes in forest cover, forage quality and road. While Rocky Mountain elk are an *Land and Resource Management Plan* MIS species, deer habitat needs are similar and they will be discussed together in this section. Differences between the two species will be highlighted.

Mule Deer *Odocoileus hemionus* **and**
White-tailed deer *Odocoileus virginianus*

Elk and deer occupy all subwatersheds within the planning area. Deer in the area are primarily mule deer although there are some white-tailed deer along the Middle Fork of the John Day River.

Elk and deer will use a variety of habitats and are adaptable. Currently, elk and deer numbers are high and the species are relatively well distributed. Exceptions include the 30,000-acre Summit Fire and the 2,300-acre Reed Fire areas where loss of natural cover and forage reduced elk and deer habitat, and likely forced animals to move to other areas. In lower elevations of the Tincup/Little Butte and Granite Boulder Subwatersheds, high open road densities also likely deter big game use.

The Malheur National Forest *Land and Resource Management Plan* (LRMP*)* establishes management direction for deer and elk via Forest-wide standards (pages IV-27 to IV-32) and Management Area direction (pages. IV-69 to IV-73 and IV-131 to IV-133). The *Land and Resource Management Plan* goal is to provide for the maintenance and enhancement of big game habitat so as to sustain elk and deer populations at levels identified by the Oregon Department of Fish and Wildlife. The analysis area is divided into summer range (40,018 acres), winter range (6,292 acres) and wildlife emphasis area (3,162 acres). *Land and Resource Management Plan* standards vary by management area. See Appendix E, Map 3—Management Areas and Roadless Areas.

Summer range is predominately in mixed conifer stands at higher elevations and during periods of high temperatures both deer and elk most likely utilize northern aspects and stands with high canopy closure. Portions of all seven subwatersheds in the analysis area are classified as summer range:

Davis/Placer, Vinegar, Vincent, Little Boulder/Deerhorn, Tincup/Little Butte, Butte, and Granite Boulder.

Winter range is primarily at lower elevations where forested areas are interwoven with non-forested grasslands and bitterbrush and mountain mahogany brush fields. Portions of four subwatersheds, Little Boulder/Deerhorn, Tincup/Little Butte, Butte and Granite Boulder are actively managed for winter range. Management Area 4a-Winter Range —establishes specific management direction (LRMP, pp. IV-69 to IV-73).

The Dixie Butte Wildlife Emphasis Area is located at higher elevations around Dixie Butte and includes portions of Davis/Placer, Little Boulder/Deerhorn, Tincup/Little Butte and Butte Subwatersheds. Much of this area is roadless. Management Area 21—wildlife emphasis area without scheduled timber harvest—establishes management direction (LRMP, pp. IV-131 to IV-133). Management focuses on a variety of wildlife species, including deer and elk.

The Malheur National Forest *Land and Resource Management Plan* defines elk and deer habitat by four broad categories based on vegetative conditions: forage, hiding cover, marginal cover, and satisfactory cover. These categories generally reflect the gradation from early to late successional structural stages. A mosaic of forage and cover areas, and adequate water, is preferred. Definitions of forage, hiding cover, marginal cover, and satisfactory cover follow:

- Forage consists of all woody and non-woody plants that are available to livestock or wildlife as a food source. Browsing refers to foraging on woody plants, typically hardwood shrubs or trees. In general, deer prefer browse forage such as shrubs and forbs while elk prefer forage dominated by grasses.
- Hiding cover, also referred to as security cover, is vegetative cover that hides at least 90 percent of an adult elk at 200 feet. Hiding cover provides a visual barrier between big game animals and potential predators or sources of disturbance, and is chiefly important during hunting season when big game alter their travel patterns to avoid humans. This provides cover for the animals and a higher quality hunting experience for the big game hunters.
- Marginal cover is defined as an area at least 30 acres in size (10 acres in winter range) and 200 yards wide with 40-59 percent forest canopy closure[62]. Marginal cover and satisfactory cover are also sometimes referred to as thermal cover. Deer and elk use this thermal cover to moderate harsh weather conditions. Under thermal cover, animals need to expend less energy for thermal regulation, i.e., to keep cooler on hot days and to keep warmer on cold days. Often, but not always, thermal cover also provides hiding cover.
- Satisfactory cover is defined as an area of the same size as marginal cover but with 60 percent or more forest canopy closure in mixed conifer stands (50% or more in ponderosa pine stands) and at least two canopy layers. Satisfactory cover is considered superior to marginal cover.

Cover comprises 39 percent of the Galena Watershed with 16 percent in satisfactory cover and 23 percent in marginal cover. In the Southeast Galena Analysis area, total cover comprises 53 percent of the area; satisfactory cover and marginal cover comprise 15 percent and 38 percent of the area, respectively. Current cover information was derived from satellite imagery data. Any cover lost to timber harvest or wildfire since the data was collected was reclassified as forage. Appendix Map 22—Big Game Cover—Existing Condition, shows the cover distribution. Cover analysis for the Southeast Galena Analysis area included stands 10 acres and greater. *Land and Resource*

[62] The ground area covered by the crowns of trees or woody vegetation as delimited by the vertical projection of crown perimeters and commonly expressed as a percent of total ground area. *Synonym*-crown cover. *Dictionary of Forestry,* Society of American Foresters 1998

Management Plan standard Number 31 directs that stands of this size can be used in winter range and elsewhere if they are providing effective use by big game. Field reconnaissance suggests that elk and deer are using these stands based on the number of tracks and pellet piles observed. Cover is fairly well distributed throughout the watershed, with the exception of the Summit and Reed Fire areas where cover was reduced to almost nothing in areas that burned intensely. Hiding cover is plentiful, although difficult to quantify. Many stands classified as satisfactory or marginal cover provide hiding or security cover. Even in non-thermal cover stands, small thickets of saplings or seedlings 1 to 2 acres in size can offer security.

Elk and deer numbers appear to be out of balance with forage, particularly in the amount of browse species. Growing conditions for forage plants are less favorable on many sites compared to historical conditions. This is largely a result of fire suppression, which allows conifers to increase and shade out understory grass and shrubs. Also, fire no longer acts as a rejuvenating agent, which invigorates many shrub and grass species and is vital for some species, such as ceanothus. Grazing and browsing pressure by deer, elk and cattle is high. In the Summit and Reed Fire areas, grass seeding immediately after the fire provided good forage for elk, and other vegetation is beginning to emerge, however, forage availability still remains low in many areas, especially in winter. Specific surveys are not available to determine forage quality.

Due to past timber harvest and fragmentation, cover and forage patches are interspersed and distributed across the landscape. Specific movement patterns of animals can only be conjectured, but current vegetative conditions provide north-south and east-west corridors to facilitate daily and seasonal species movements (see Appendix E, Map 20—Wildlife Connectivity—For Action Alternatives). Connectivity is provided in areas where stand density is moderate to high; however, breaks in connective corridors occur in some areas as the result of past timber harvest, fire, insect and disease outbreaks, and natural openings.

Optimum calving and fawning habitat includes a combination of thermal cover, hiding cover, and quality forage located in close proximity to water (USDA, 1979). Habitat is provided primarily within riparian areas where high quality succulent vegetation and water are readily available. Hardwood shrubs, thickets of conifer saplings and seedlings, and down logs provide hiding/security cover. Typically calving and fawning habitat is located in spring/fall range where slopes are usually less than 15%. These gentle sloped areas however are often located on benches surrounded by steep topography (USDA, 1979).

In the analysis area, untreated, riparian areas at mid-elevations probably provide some of the best calving and fawning habitat, at least where open roads have not been constructed directly in the riparian areas. Typically conifer stocking is higher and stand structure more complex than in adjacent upland areas where trees have often been thinned. Although hardwood shrubs are generally in an upward trend, it is suspected that species composition, distribution and vigor are presently lower than potential levels throughout much of the watershed. In some areas, shrubs are old and decadent and not reproducing well. Aspen stands are very limited, in poor condition and continuing to decline. Fire suppression, conifer encroachment, stream channel and floodplain modification along with big game and livestock browsing continue to limit recovery of hardwoods from their historic abundant levels throughout the analysis area. Hardwood vegetation levels could be increased along many stream reaches including: Butte Creek, Caribou Creek, Davis Creek, Deadcow Gulch, Deerhorn Creek, Flat Creek, Granite Boulder Creek, Little Butte Creek, Little Boulder Creek, Murdock Creek, Placer Gulch, Tincup Creek, Vincent Creek, Vinegar Creek and Windlass Creek. The presence of roads in riparian areas may reduce the effectiveness of calving and fawning habitat, not only because roads convert habitat to non-habitat, but also because road traffic during the spring and early summer may disturb animals and their young.

Deer, and especially elk, are quite vulnerable to human disturbance. Scientific research shows that higher open road densities reduce deer and elk habitat effectiveness (Thomas et al 1990). Roads open to motorized traffic allow people easy access to big game habitat. Motor vehicles and associated human activities can stress big game animals, causing them to avoid use of available habitat and unnecessarily expend energy. Researchers have reported decreased use of areas within ½ mile of roads. This can lead to poor distribution of animals within available habitat. Easy access on forest roads also lead to reduced deer and elk escapement during hunting seasons and facilitates illegal taking of game animals. In the Southeast Galena Restoration Analysis area, high open road density may be limiting use of habitat in some areas, particularly at lower elevations in the Tincup/Little Butte and Granite Boulder Subwatersheds. Road closures can be used to reduce access and consequently, reduce the potential for disturbance.

Habitat for elk and deer was probably better prior to settlement by Euro-Americans than today because there were more open stands with native grasses and healthy fires adapted shrubs for forage, plus a good distribution of cover for thermal regulation. More importantly, roads and associated human access were much more limited prior to settlement, and consequently elk and deer were not impacted by human disturbance to the extent that occurs under present conditions. Although, American Indians had some effect on the populations of these animals prior to Euro-American settlement, it is unknown what extent, or degree this effect occurred. Actual numbers of elk on the National Forest may have been lower than the present numbers. This is because elk probably used more of the lower elevation foothills and valleys on what are now, non-National Forest lands. Human development in these bottomlands has pushed more elk up onto National Forest lands. Mule deer were likely more abundant in the mountains. White-tail deer would have used the river bottom and lower slope areas. Wolves were the primary predator before settlement by Euro-Americans. Wolves hunting in packs probably limited population numbers of all wild ungulate species (deer and elk).

Thomas et al. (1988) developed the Habitat Effectiveness Index (HEI) model for estimating elk habitat effectiveness on the landscape. Overall habitat effectiveness (HEcsrf) incorporates four variables or indices: cover quality (HEc), size and spacing of cover (HEs), density of roads traveled by vehicles (HEr), and quality and quantity of forage (HEf). The Malheur *Land and Resource Management Plan* establishes minimum standards for these indices. In addition, the *Land and Resource Management Plan* identifies minimum standards for retention of satisfactory cover (%S), marginal cover (%M), and total cover (%S+M). The LRMP also establishes standards for open road density.

Table 102, Table 103, and Table 104 display existing HEI values, cover percentages and open road densities by subwatershed. Standards are different for summer range and winter range, as well as for the Dixie Butte Wildlife Emphasis Area. *Land and Resource Management Plan* standards are displayed at the beginning of each table. The forage indice (HEf) is only used when evaluating winter range and wildlife emphasis areas.

Table 102 Summer Range—Existing HEI values, cover percentages and open road densities by subwatershed.

Subwatershed	HEc	HEs	HEr	HEsrc (HEI)	%S	%M	Total Cover %	Open Road Density (miles per square mile)
LRMP STANDARD Summer Range	.30	.30	.40	.40	12%	5%	20%	3.2 (1.5)♥
Davis/Placer	.67	.47	.48	.52	17	34	51	2.05
Vinegar	.53	.64	.54	.54	2	40	42	1.84
Vincent	.53	.63	.50	.54	3	38	41	1.64
L.Boulder/Deerhorn	.59	.42	.57	.52	12	52	64	1.21
Tincup/Little Butte	.70	.43	.55	.54	29	42	71	1.42
Butte	.76	.59	.55	.59	23	21	44	1.38
Granite Boulder	.73	.53	.55	.57	23	27	50	1.34

HEI = Habitat Effectiveness Index HEI = $(HEc \times HEs \times HEr)^{1/3}$
HEc = habitat effectiveness derived from the quality of cover
Hes = habitat effectiveness derived from the size and spacing of cover
HEr = habitat effectiveness derived from the density of roads open to vehicular traffic
%S = Satisfactory Cover
%M = Marginal Cover
% Total Cover = %S + %M

♥The *LRMP* standard for open road density in summer range is 3.2 miles per square mile; however, the LRMP Record of Decision directs that managers will strive for an open road density of 1.5 miles per square mile.

In summer range, HEI values exceed *Land and Resource Management Plan* standards in all subwatersheds. Total cover exceeds *Land and Resource Management Plan* standards, as does marginal cover (%M), but satisfactory cover (%S) is below standards in the Vinegar and Vincent Subwatersheds. The Vincent and Vinegar Subwatersheds are at 2% and 3% satisfactory cover respectively, rather than the requisite 12%. All subwatersheds meet the minimum standard for open road density (3.2 miles of open road per square mile), but do not always meet the target level recommended in the *Land and Resource Management Plan* Record of Decision (1.5 miles of open road per square mile). Four of the seven subwatersheds meet this desired target level.

In the Vinegar and Vincent Subwatersheds, the low satisfactory cover values may not be unreasonable. Cover requirements may not always be compatible with Historical Range of Variability (HRV). This conflict is readily apparent in the Dry Forest types dominated by ponderosa pine. Historical conditions and fire return intervals favored large blocks of single story, mature stands with canopy closure too low to support large blocks of satisfactory or marginal cover. Under historical conditions, cover percentages would be inherently low, probably below *Land and Resource Management Plan* standards. Today, cover requirements are being met on many ponderosa pine sites; however, stands are overstocked and at high risk to bark beetle attack and uncharacteristically severe wildfire. Cover levels may not be sustainable under these conditions. Unfortunately, tree thinning, the treatment that most effectively reduces beetle and fire risk, also reduces the effectiveness of a stand as cover.

Table 103 Winter Range —Existing HEI values, cover percentages, and open road densities by subwatershed.

Subwatershed	HEc	HEs	HEr	HEf	HEsrcf (HEI)	%S	%M	Total Cover %	Open Road Density (miles per square mile)
LRMP STANDARD Winter Range	.40	.30	.50	.40	.50	10%	10%	25%	2.2 (1.0) ♥
Davis/Placer	---	---	---	---	---	---	---	---	---
Vinegar	---	---	---	---	---	---	---	---	---
Vincent	---	---	---	---	---	---	---	---	---
L.Boulder/Deerhorn	.56	.75	.68	.50	.62	5	34	39	0.72
Tincup/Little Butte	.58	.63	.30	.50	.48	5	26	31	3.92
Butte	.71	.76	.63	.50	.64	19	26	45	0.90
Granite Boulder	.60	.55	.10	.50	.36	12	44	56	7.00

HEI = Habitat Effectiveness Index HEIcsrf = (HEc x HEs x HEr x HEf)1/4

HEc = habitat effectiveness derived from the quality of cover

Hes = habitat effectiveness derived from the size and spacing of cover

HEr = habitat effectiveness derived from the density of roads open to vehicular traffic

HEf = habitat effectiveness derived from the quantity and quality of forage

%S = Satisfactory Cover

%M = Marginal Cover

% Total Cover = %S + %M

♥The $_{LRMP}$ standard for open road density in winter range is 2.2 miles per square mile; however, the LRMP Record of Decision directs that managers will strive for an open road density of 1.0 mile per square mile.

In winter range, HEI values exceed *Land and Resource Management Plan* standards in all subwatersheds except the Tincup/Little Butte and Granite Boulder Subwatersheds where high road densities resulted in poor HEr values. *Land and Resource Management Plan* standards require 2.2 miles of open road per square mile. The Tincup/Little Butte Subwatershed currently has an open road density of 3.9 miles/square mile and the Granite Boulder Subwatershed has an open road density of 7 miles per square mile. Two of the four subwatersheds meet the road density target level in the *Land and Resource Management Plan* Record of Decision (1.0 mile of open road per square mile).

Total cover exceeds *Land and Resource Management Plan* standards, as does marginal cover (%M), but satisfactory cover (%S) is below standards in the Little Boulder/Deerhorn and Tincup/Little Butte Subwatersheds. Both subwatersheds are at 5% satisfactory cover rather than the requisite 10%. Cover requirements in winter range, as discussed for summer range, are also likely incompatible with HRV. This inherent conflict may be even more relevant in winter range, which is often located in low elevation, Dry Forest types. For example, winter range in the Little Boulder/Deerhorn and Tincup/Little Butte Subwatersheds is predominantly on south facing slopes at lower elevation, and is dominated by these Forest types. The low satisfactory cover values may better reflect historic conditions.

Although forage values meet standards, quality and quantity of forage are difficult to estimate and as stated in Chapter 1, believed to be below potential. Native grasses, forbs, and shrubs, that are adapted to short fire return intervals and the higher sunlight of open, Dry Forest environments, are not as numerous or vigorous as they were in the past. Fire suppression has allowed overstory conifers to increase in numbers, which has to a large extent shaded out this important component of the analysis area's vegetation. Currently, low intensity burns (which occurred historically in the analysis area), no longer stimulate common species such as pine grass, blue wild rye, and bitterbrush, while browsing pressure from both wild and domestic ungulates prevent these plants from regenerating. Elk, for instance, currently have population numbers, which exceed State goals,

and are not in balance with the existing forage of the analysis area. Forage is considered more important in winter range than in summer range.

Table 104 Wildlife Emphasis Area—Existing HEI values, cover percentages and open road densities by subwatershed.

Subwatershed	HEc	HEs	HEr	HEf	HEsrcf (HEI)	%S	%M	Total Cover %	Open Road Density (miles per square mile)
LRMP STANDARD Wildlife Emphasis	.50	.60	.60	.50	.70	20%	20%	40%	1.5
Davis/Placer	.53	.55	1.0	.50	.62	2	24	26	0.00
Vinegar	---	---	---	---	---	---	---	---	---
Vincent	---	---	---	---	---	---	---	---	---
L.Boulder/Deerhorn	.79	.46	1.0	.50	.65	43	30	73	0.00
Tincup/Little Butte	.96	.26	1.0	.50	.59	85	8	93	0.00
Butte	.74	.44	.64	.50	.57	38	43	81	0.84
Granite Boulder	---	---	---	---	---	---	---	---	---

HEI = Habitat Effectiveness Index HEIcsrf = (HEc x HEs x HEr x HEf)1/4

HEc = habitat effectiveness derived from the quality of cover

Hes = habitat effectiveness derived from the size and spacing of cover

HEr = habitat effectiveness derived from the density of roads open to vehicular traffic

HEf = habitat effectiveness derived from the quantity and quality of forage

%S = Satisfactory Cover

%M = Marginal Cover

% Total Cover = %S + %M

In the Dixie Butte Wildlife Emphasis Area, overall HEI values are below standards in all subwatersheds. Large, unfragmented blocks of cover habitat have resulted in high HEc values and low HEs values. As with summer and winter range, the HEI model may not be compatible with managing these landscapes for HRV or for species that require large blocks of unfragmented habitat; rather, the model assumes that an ideal landscape is one fragmented by a checkerboard pattern of cover and forage stands. The Dixie Butte area is in high elevation, Cold and Moist Forests. A natural fire regime of low frequency/high intensity fires allows for the development of large, contiguous blocks of old growth habitat, exactly the condition of the area today. Eventually, stand replacement wildfire may convert large areas to forage habitat. Historically, high HEs values may only have been obtainable following such a large fire disturbance. Although current conditions may not be ideal for deer and elk, they do meet habitat requirements for other wildlife species, such as primary cavity nesters and forest carnivores that require large, contiguous blocks of old-growth habitat. In reality, deer and elk use of the Dixie Butte Wildlife Emphasis Area, is high during the summer due to cooler temperatures and higher stand densities that afford decreased human access and increased big game security.

In the wildlife emphasis area, the Davis/Placer Subwatershed is below total cover requirements with only 26% cover rather than the requisite 40% cover. This can be attributed to the large number of acres around Dixie Butte that are naturally non-forested. This open, steppe habitat consists of grasslands, shrublands and talus fields and is incapable of ever meeting cover requirements. Only 2% of the forested habitat is in satisfactory cover, well below the requisite 20%. This can also be attributed to site conditions. Much of the forested habitat is in subalpine plant associations on east slopes and 60% canopy closure is probably not obtainable on these cold, harsh sites.

The open road density standard for this management area is 1.5 miles per square mile. This standard is met in all subwatersheds. Although overall objectives in wildlife emphasis areas are to

manage for an unroaded condition, some road construction is permitted. Only one open road (Forest Road 2610-759) currently bisects the Dixie Butte Wildlife Emphasis Area. This road is part of a loop access route to Dixie Summit, and is a popular travel route during hunting season. An open road density of 0.84 miles per square mile meets the road density standard.

Table 105 combines the Summer Range, Winter Range and Wildlife Emphasis Values from Table 102, Table 103, and Table 104, providing an all-inclusive way to display and compare existing values.

Table 105 Summer Range, Winter Range and Wildlife Emphasis Area. Existing HEI values, cover percentages and open road densities by subwatershed.

Subwatershed Management Area	HEc	HEs	HEr	HEf	HEsrcf (HEI)	%S	% M	Total Cover %	Open Road Density (miles per square mile)
LRMP STANDARDS									
Summer Range	.30	.30	.40	N/A	.40	12%	5%	20%	3.2 (1.5)♠
Winter Range (4a)	.40	.30	.50	.40	.50	10%	10%	25%	2.2 (1.0)
Wildlife Emphasis (21)	.50	.60	.60	.50	.70	20%	20%	40%	1.5
Davis/Placer									
Summer Range	.67	.47	.48	N/A	.52	17	34	51	2.05
Winter Range (4a)	---	---	---	---	---	---	---	---	---
Wildlife Emphasis (21)	.53	.55	1.0	.50	.62	2	24	26	0.0
Vinegar									
Summer Range	.53	.64	.50	N/A	.54	2	40	42	1.84
Winter Range (4a)	---	---	---	---	---	---	---	---	---
Wildlife Emphasis (21)	---	---	---	---	---	---	---	---	---
Vincent									
Summer Range	.53	.63	.52	N/A	.54	3	38	41	1.64
Winter Range (4a)	---	---	---	---	---	---	---	---	---
Wildlife Emphasis (21)	---	---	---	---	---	---	---	---	---
Little Boulder/Deerhorn									
Summer Range	.59	.42	.57	N/A	.52	12	52	64	1.21
Winter Range (4a)	.56	.75	.68	.50	.62	5	34	39	0.72
Wildlife Emphasis (21)	.79	.46	1.0	.50	.65	43	30	73	0.0
Tincup/Little Butte									
Summer Range	.70	.43	.55	N/A	.54	29	42	71	1.42
Winter Range (4a)	.58	.63	.30	.50	.48	5	26	31	3.92
Wildlife Emphasis (21)	.96	.26	1.0	.50	.59	85	8	93	0.0
Butte									
Summer Range	.76	.59	.55	N/A	.59	23	21	44	1.38
Winter Range (4a)	.71	.76	.63	.50	.64	19	26	45	0.90
Wildlife Emphasis (21)	.74	.44	.64	.50	.57	38	43	81	0.84

Subwatershed Management Area	HEc	HEs	HEr	HEf	HEsrcf (HEI)	%S	% M	Total Cover %	Open Road Density (miles per square mile)
LRMP STANDARDS									
Granite Boulder									
Summer Range	.73	.53	.55	N/A	.57	23	27	50	1.34
Winter Range (4a)	.60	.55	.10	.50	.36	12	44	56	7.00
Wildlife Emphasis (21)	---	---	---	---	---	---	---	---	---

NOTES:

HEI = Habitat Effectiveness Index for summer range HEIcsr = (HEc x HEs x HEr)1/3

HEI = Habitat Effectiveness Index for winter range and wildlife emphasis area HEIcsrf = (HEc x HEs x HEr x HEf)1/4

HEc = habitat effectiveness derived from the quality of cover

Hes = habitat effectiveness derived from the size and spacing of cover

HEr = habitat effectiveness derived from the density of roads open to vehicular traffic

HEf = habitat effectiveness derived from the quantity and quality of forage

%S = Satisfactory Cover %M = Marginal Cover

% Total Cover = %S + %M

♠The LRMP standard for open road density in summer range is 3.2 miles per square mile; however, the LRMP Record of Decision directs that managers will strive for an open road density of 1.5 miles per square mile. In winter range, the standard is 2.2 miles per square miles, but managers will strive for 1.0 mile per square mile.

3.2.6.3—Species of Interest (SOI)

Several wildlife species/groups that are of high public interest but not classified as Threatened, Endangered or Sensitive (TES) species or Management Indicator Species (MIS). Habitat conditions and needs for northern goshawks, blue grouse, and landbirds/neotropical migrant birds are summarized below.

Northern Goshawk *Accipter gentilis*

Northern goshawks are known to use interior forests habitats of mature and old growth. These raptors prefer mature and over mature stands in mixed conifer with overstory ponderosa pine, but need a more open understory or openings for hunting compared to other interior forest raptors. Nests are often within ¼ mile of flowing water (De Stephano, 1992). Goshawk territories vary from 1 to 2 square miles, i.e., 640 acres to 2,560 acres.

Goshawks are not considered a MIS, but there is some concern with habitat loss. *Land and Resource Management Plan* Amendment 2 identifies goshawks as an important indicator for interior late and old structure habitat. The *Land and Resource Management Plan* requires that a 30-acre nest area and 400-acre Post-fledging Area (PFA) be established around all active and historic nest trees.

Primary nesting habitat consists of OFMS cool moist and warm dry mixed conifer stands, often with a dominant presence of large ponderosa pine. Approximately 29,000 acres of potential habitat exists. Of that, 6,400 acres, or 22%, are in OFMS that are preferred by this species. These habitats also function as foraging areas. Secondary nesting habitats, generally young forest multiple story (YFMS) often lacking the large tree component, occurs on 11,850 acres. Additional foraging habitat, consisting primarily of stem exclusion open canopy (SEOC) and understory re-initiation (UR), occurs on 7,260 acres. Total foraging habitat is found on 25,510 acres.

Four nest sites, have been identified in Southeast Galena as supporting reproducing pairs of northern goshawks. A 30-acre nest site and 400-acre PFA have been established around each of the four nest sites. Nest sites may or may not be active in all years. Table 106 identifies the four sites and activity monitoring results.

Table 106 Goshawk Nests/Post-fledging (PFA) area

Post-fledging Area (PFA) Name	Subwatershed	Activity Record
Deerhorn	Little Boulder Creek/Deerhorn 30207	Active in 1993. Inactive in 1994, 1997 and 2000. Nest site not visited in 1998 and 1999. .
Little Boulder	Little Boulder Creek/Deerhorn 30207	Active in 1996 and 1998. Inactive 1997, 1999, and 2000. Adults in area in 1999 and 2000.
Placer Gulch	Davis Creek/Placer Gulch - 30201	Active in 1997 and 1998. Nest tree blown down in 1999. Site inactive in1999 and 2000.
Sulpher	Butte Creek – 30213	Active in 1995, 1996 and 1997. Inactive in 1998, 1999, and 2000.

The Southwestern Guide for managing goshawks (USDA 1992) recommends that PFAs be managed for the following structural stages[63] and percentages: OFMS and YFMS at 60%, SEOC and UR at 20%, SI at 10% and grass/forbs at 10%. All four PFAs generally meet these recommendations, although three out of four PFAs are skewed towards the older structural stages. The Placer Gulch PFA is dominated by YFMS stands rather than OFMS stands.

Blue Grouse Dendragapus obscurus

Blue grouse are listed in the *Land and Resource Management Plan* as a featured species requiring management consideration. Blue grouse inhabit coniferous forests intermixed with grassy or bare, shallow-soiled openings. For winter roosts, they use large mistletoe-infected Douglas-fir trees, typically located near or at the upper 1/3 of the slope (Schroeder 1984). Approximately 1,700 acres are in plant associations and stand structure that could provide winter roost habitat. This is likely a conservative estimate of habitat. Only OFMS, OFSS, and YFMS stands in the Douglas-fir series were considered in the estimate. In actuality, it is likely that many mixed conifer stands in the grand-fir series would also have Douglas-fir as a substantial species component. Classified acres have not been specifically surveyed for potential winter roost trees. *Land and Resource Management Plan* standard 50 directs managers to maintain winter roost habitat.

Land Birds including Neo-Tropical Migrant Birds

A wide variety of land birds, including neo-tropical migrant birds, use habitats available within the analysis area. Habitats include a mixture of conifer forest, hardwood habitats, riparian areas and meadow habitats. Nesting, foraging and cover security needs are generally provided. The abundance of conifer habitats, present in a variety of stand structures and vegetative compositions, provides suitable habitat for most of the conifer habitat dependent species. Exceptions exist for those species that depend upon mature, open park-like ponderosa pine habitats that are severely lacking within the analysis area. White-headed woodpecker, Lewis' woodpecker (both also MIS), flammulated owl and chipping sparrow have likely been affected by decline in this habitat. Those species heavily dependent upon riparian or hardwood habitats such as aspen, cottonwood or willow stands are not adequately provided for due to poor habitat condition and distribution. Species such as the red-naped sapsucker (also MIS), hermit thrush, red-eyed vireo and olive-sided flycatcher are likely affected. Grassland/meadow habitats are also on the decline as conifers continue to encroach into previously non-forested areas.

[63] See Structural stage definitions on page145.

3.2.6.4—Habitat Summary Tables

Table 107 through Table 111 summarize the relationships between the various TES species, MIS and SOI and each Forest type and structural stage (e.g. Dry Forest OFMS). Essentially, forest types and structural stages describe habitat types.

3.2.6.4.1—Dry Forests and Associated Wildlife Species

The Dry Forests are generally less structurally and compositionally diverse than the other forest types. They include two general categories: the *hotter* Dry Forests types and the *warmer* Dry Forest types. Hot Dry Forest types generally include the pure ponderosa pine forest types and ponderosa pine/Douglas-fir mixes. The warm Dry Forest types include the mixed conifer stands with a high component of grand fir. The "climax" structural potential for the warm Dry Forests is both OFSS and OFMS[64]. The OFSS condition, more often associated with the pure ponderosa pine stands, provides important habitat for white-headed woodpeckers, Lewis' woodpeckers, flammulated owls and various other birds and mammals. The OFMS condition, more often associated with the mixed conifer stands, provides important late successional habitat for such species as pileated woodpeckers, pine martens, fishers and goshawks. Table 107 displays the relationships of Dry Forest structural stages to various wildlife species and provides a summary of the current habitat

[64] See structural stage definition, page 145

Table 107 Relationship of Dry Forests to Wildlife Habitats and Existing Condition

Stand Structure	SI	SEOC	SECC	UR	YFMS	OFMS	OFSS
Wildlife Species	**TES**						
Gray Wolf				C	C	C	
Canada Lynx	F♠		F♦♦	F♠	D♦♦ F♦♦	D♠	
California Wolverine				C	C	C	
Pacific Fisher					N♦♦ F♦♦	D♠ F♠	
Gray Flycatcher		N F					N F
Sage Grouse		N F					N F
MIS							
Pileated Woodpecker					N♦♦ F♦♦	N♠ F♠	
Pine Marten					D F	D F	
Three-toed Woodpecker						N F	
White-headed Woodpecker						N♦♦ F♦♦	N♠ F♠
Black-backed Woodpecker						N F	
Lewis' Woodpecker							N F
Williamson's Sapsucker					N F	N F	
Red-naped Woodpecker					N F	N F	
Hairy Woodpecker					N F	N F	
Downy Woodpecker					N F	N F	
Northern Flicker					N F	N F	
Others							
Northern Goshawk		F♦♦			N♦♦ F♠	N♠ F♠	F♠
Acres of Habitat, % Total Habitat and HRV							
Acres of Habitat	1,450	12,180	870	2,030	8,700	3,480	290
% Total Habitat (29,000 ac.)	5%	42%	3%	7%	30%	12%	1%
HRV	(5-15%)	(5-25%)	(5-10%)	(5-10%)	(5-15%)	(5-15%)	(30-55%)

C = Connectivity/Corridor Habitat
D = Denning
F = Foraging
N = Nesting
♠ = Primary Habitat
♦♦ = Secondary Habitat

The Dry Forest type is the most abundant forest type within the analysis area, covering 29,000 acres. OFSS structure is conspicuously absent. Historically, 30-55% of hot dry habits were in OFSS. Today, only 290 acres or 1% of the habitat is OFSS. This raises concern for species such as the white-headed woodpecker and flammulated owl. Primary nesting and foraging habitat, composed of the mature, open park-like ponderosa pine habitats, is not available. Sparse pine

habitats that are transitioning to non-forest may provide habitat for gray flycatcher and sage grouse, at least where sagebrush is a common understory species.

YFMS is in excess of that believed to have occurred historically. Consequently, the Dry Forests may be providing higher levels of habitat for species such as the pileated woodpecker and pine marten then they did historically. Habitat may be degraded, however, due to deficiencies in large snags and downed log habitat. Pileated woodpeckers and pine martens typically demand higher levels of dead wood habitat, and consequently, habitat for these species may be of less value than similar structural stages in the Moist and Cold forest types.

In the Dry Forests, dead wood habitat for primary cavity excavators is deficient. The *Land and Resource Management Plan* specifies that in order to provide habitat for 100 percent potential population levels of primary cavity excavator species, i.e., it is necessary to have a minimum of 2.39 snags per acre >21" dbh, averaged over each 40-acre parcel of forested land. In the Dry Forests, there are probably areas 40 acres in size or larger with very few or no snags, providing habitat for less than 20 percent potential population levels. Past harvest practices and firewood cutting likely removed the majority of the existing snags. Stands are in younger structural stages and consequently deficient in large diameter trees. Because stands are overstocked, individual tree growth is low. Without management is it is unlikely these stands can grow the large diameter trees required to provide a sustained flow of large diameter snags. In Dry Forest areas, population viability for primary cavity excavator species is likely to remain low.

While some corridor habitat is present for the lynx, wolverine and gray wolf, its value as habitat is reduced, due in large part to the poorer cover conditions that naturally occur in the drier, lower productivity plant associations.

3.2.6.4.2—Moist Forests and Associated Wildlife Species

The Moist Forest types have a high degree of structural and compositional diversity, providing habitat for a wide diversity of wildlife species. Their occurrence in the moister, more productive areas makes them capable of providing high quality cover habitat. The "climax" structural potential for these forests is OFMS. This condition provides important late successional habitat for pileated woodpeckers, pine martens, lynx and fishers. The presence of lodgepole pine during early successional stages and in gaps within later successional stages provides lynx foraging habitat and quality hiding cover habitat. Table 108 displays the relationship of the moist structural stages to various wildlife species and provides a summary of the current habitat conditions.

Table 108 Relationship of Moist Forests to Wildlife Habitats and Existing Condition

Stand Structure	SI	SEOC	SECC	UR	YFMS	OFMS	OFSS
Wildlife Species	**TES**						
Gray Wolf				C	C	C	
Canada Lynx	F♠		F♦♦	F♠	D♦♦ F♦♦	D♠	
Wolverine				C	D F	D F	
Pacific Fisher					N♦♦ F♦♦	D F	
MIS							
Pileated Woodpecker					N♦♦ F♦♦	N♠ F♠	
Pine Marten					D F	D F	
Three-toed Woodpecker						N F	
White Headed Woodpecker							NF
Black-backed Woodpecker						N F	
Williamson's Sapsucker					N F	N F	
Red-naped Woodpecker					N F	N F	
Hairy Woodpecker					N F	N F	
Downy Woodpecker					N F	N F	
Northern Flicker					N F	N F	
Others							
Northern Goshawk		F♦♦			N♦♦ F♠	N♠ F♠	F♠
Acres of Habitat % Total Habitat (11,500 ac.) HRV Range	690 6% (10-30%)	690 6% (5-10%)	460 4% (10-20%)	690 6% (10-20%)	4,485 39% (10-20%)	3,910 34% (15-40%)	575 5% (5-15%)

C = Connectivity/Corridor Habitat ♠ = Primary Habitat
D = Denning ♦♦ = Secondary Habitat
F = Foraging
N = Nesting

The Moist Forest types comprise 11,500 acres, and consequently provide a significant habitat community within the analysis area. About 73% of this forest type is in a structural condition that provides nesting and foraging habitat for primary cavity excavators; 34% is in a high quality habitat condition. Snag and down log densities are higher in the Moist Forests than they are in Dry Forests, likely meeting *Land and Resource Management Plan* standards for 100% potential population levels.

The 1994 Reed Fire and 1998 Vincent/Vinegar Windstorm dramatically increased snags and downed logs in localized areas; although most primary cavity excavator species respond favorably to such disturbance events, three-toed and black-backed woodpeckers likely benefited the most.

Denning and foraging habitat is provided for lynx and pine marten. Goshawk nesting and foraging is provided, both in primary and secondary habitat conditions. Connectivity habitat for wolverine, lynx and gray wolf is abundant within this forest type.

3.2.6.4.3—Lodgepole Forests and Associated Wildlife Species

The Lodgepole Pine types are compositionally very simple – being dominated by lodgepole pine—yet structurally diverse providing a range of specialized habitats. The "climax" structural potential for lodgepole pine stands is OFMS. Under natural disturbance regimes, lodgepole forests have a much shorter successional cycle than the Dry, Moist and Cold Forest types, typically succeeding from SI through OFMS in 100 to 140 years versus 200+ years for the other Forest types. Table 109 displays the relationship between the lodgepole pine forest structures and associated wildlife habitats and summarizes existing conditions.

Table 109 — Relationship of Lodgepole Pine Forests to Wildlife Habitats and Existing Condition

Stand Structure / Species	SI	SEOC	SECC	UR	YFMS	OFMS	OFSS
TES							
Gray Wolf				C	C	C	
Canada Lynx	F♠		F♠	F♦♦	D♦♦ F♦♦	D♠	
Wolverine				C	D F	D F	
Pacific Fisher					N♦♦ F♦♦	D♠ F♠	
MIS							
Pine Marten					N♦♦ F♦♦	D♠ F♠	
Three-toed Woodpecker						N F	
Black-backed Woodpecker				F	N F	N F	
Acres of Habitat: % Total Habitat (1,100 ac.) HRV Range:	0 0% (5-30%)	30 3% (5-10%)	195 18% (5-50%)	260 24% (5-15%)	435 39% (5-15%)	180 16% (5-15%)	0 0% (5-10%)

C = Connectivity/Corridor Habitat ♠ = Primary Habitat
D = Denning ♦♦ = Secondary Habitat
F = Foraging
N = Nesting

The lodgepole pine habitats are one of the least abundant habitats, comprising only 1,100 acres of the analysis area. These habitats, however, are of particular importance to four species. Lynx use these habitats extensively for their foraging needs, particularly the SI and UR structural stages, but also the SEOC and SECC stages. Eventually, Stem Exclusion stands(SEOC and SECC) deteriorate due to mountain pine beetle attack. Trees killed by beetles eventually fall, and create a layer of jackstrawed logs. Overstory canopies are opened up, permitting regeneration of a second, and

eventually third, canopy layer of young lodgepole pine. OFMS and YFMS stands have the best potential to provide denning habitat; jackstrawed trees killed by mountain pine beetle provide denning structures and understory lodgepole have grown in, increasing canopy closure. Pine marten and fisher will also use these late structural stages; complex lower stand structures provide resting sites, subnivean (below snow) access for winter foraging, and cover from predators. Three-toed and black-backed woodpeckers prefer OFMS and YFMS as nesting and foraging habitat. Currently 55% of these lodgepole pine stands are in the OFMS and YFMS structural stages, well over the 10%-30% range believed to have occurred historically.

3.2.6.4.4—Cold Forests and Associated Wildlife Species

Cold Forest types are similar to Moist Forest types in that they typically have a high degree of structural and compositional diversity. High productive sites provide high quality cover habitat similar to those found in the Moist Forest types. At the highest elevations, however, site productivity is usually reduced. Stands cannot support the large diameter trees and canopy covers that lower elevations support. Stands become more fragmented, occurring in a mixture of forested areas and open alpine meadows. The “climax” structural potential for Cold Forests is OFMS. This condition, at least on the higher productive sites, provides important late successional habitat for pileated woodpecker, pine marten, fisher, lynx and wolverine. The presence of lodgepole pine during early successional stages and in gaps with later successional stages provides lynx foraging habitat and quality hiding cover habitat. Table 110 displays the relationship of the moist structural stages to various wildlife species and provides a summary of the current habitat conditions.

Table 110 Relationship of Cold Forests to Wildlife Habitats and Existing Condition

Species	SI	SEOC	SECC	UR	YFMS	OFMS	OFSS
TES							
Gray Wolf				C	C	C	
Canada Lynx	F♠		F♦♦	F♠	D♦♦ F♦♦	D♠	
Wolverine				C	D F	D F	
Pacific Fisher					N♦♦ F♦♦	D♠ F♠	
MIS							
Pileated Woodpecker					N♦♦ F♦♦	N♠ F♠	
Pine Marten					D F	D F	
Three-toed Woodpecker						N F	
Black-backed Woodpecker						N F	
Lewis' Woodpecker						N F	
Williamson's Sapsucker					N F	N F	
Red-naped Woodpecker					N F	N F	
Hairy Woodpecker					N F	N F	
Downy Woodpecker					N F	N F	
Northern Flicker					N F	N F	
Acres of Habitat: % Total Habitat (2,000 ac.) HRV Range:	0 0% (20-25%)	320 16% (5-10%)	180 9% (5-20%)	0 0% (5-10%)	1,140 57% (20-30%)	360 18% (15-25%)	0 0% (5-10%)

C = Connectivity/Corridor Habitat ♠ = Primary Habitat
D = Denning ♦♦ = Secondary Habitat
F = Foraging
N = Nesting

The Cold Forest habitats are one of the least abundant habitats, comprising only 2,000 acres of the analysis area. In Southeast Galena, these habitats are primarily located in the Dixie Butte Wildlife Emphasis Area and Vinegar Hill-Indian Rock Scenic Area, areas that are less developed and consequently, receive fewer disturbances. Wolverines are particularly sensitive to disturbance and may be using these areas. OFMS and YFMS provide denning and foraging opportunities for wolverine, lynx, fisher and marten. Snag and down log densities are higher in Cold Forests than they are in Dry Forests at lower elevations. OFMS and YFMS habitat provide nesting and foraging habitat for primary cavity excavators. Eighteen percent of the habitat is in a high quality condition. Corridor habitat for wolverine, lynx, fisher, marten and gray wolf is abundant within these forest types. YFMS appears elevated at 57%, while SI is deficient at 0%. This can probably be attributed

to the absence of any recent major disturbance such as wildfire. When structural stages are viewed across the entire Galena Watershed, however, structural stage distribution matches HRV (Malheur National Forest 1999). The Summit Fire converted a large portion of the watershed to SI. Consequently, a deficiency in SI habitat in Southeast Galena is probably not critical to any species.

3.2.6.4.5—Unique and Sensitive Habitats: Non-Forested Areas, Hardwoods, and Juniper Woodlands

A variety of unique and sensitive habitats (springs, seeps, wallows, wet and dry meadows, sagebrush fields, aspen stands, mountain mahogany patches, rock outcrops, talus slopes and juniper woodlands) exist across the analysis area. These diverse and widely distributed vegetation types provide a variety of specialized habitats. Locations of the larger habitat areas are generally well documented. Locations of the smaller habitat areas, such as springs and seeps, are not always well documented. Habitat conditions are often unknown.

Table 111 displays the relationship between these various vegetation types and associated wildlife habitats.

Table 111 Relationship of Non-Forested Areas, Hardwoods, and Juniper Woodlands to Wildlife Habitats and Existing Condition

Species	Non-Forested Habitats (Moist)	Non-Forested Habitats (Dry)	Young Hardwood Habitats	Mature Hardwood Habitats	Juniper Woodlands
TES					
Canada Lynx			F♠	F♦♦	
Sandhill Crane	N F				
Long-billed curlew	N F				
Gray Flycatcher		N F			N F
Bobolink	N F	N F			
Sage Grouse		N F			N F
MIS					
Lewis' Woodpecker			F	N F	
Williamson's Sapsucker			F	N F	
Red-naped Woodpecker			F	N F	
Downy Woodpecker			F	N F	
Acres of Habitat: % Total Habitat (ac.)	860 15%	3,475 60%	0 0%	28 <1%	1,400 24%

C = Connectivity/Corridor Habitat ♠ = Primary Habitat
D = Denning ♦♦ = Secondary Habitat
F = Foraging
N = Nesting

Timber harvest, grazing, fire suppression, road construction, recreation development, mining and natural events such as fire and drought, have impacted many of these habitats to one degree or another. Approximately 860 acres of wet meadow is available for sandhill cranes and long-billed curlews. Only the open areas along the Middle Fork John Day River (610 acres) likely have habitat that will support these species, and most of this habitat is on private land. Other wet meadows are generally smaller in size, probably limiting the use by cranes and curlews. Sage grouse may occupy sagebrush habitats and juniper/sagebrush habitats, but these habitats are rather limited compared to large expanses on the southern, drier end of the Malheur National Forest. Habitat for gray flycatchers often overlaps with habitat for sage grouse. Hardwoods trees are very limited, including 28 acres of mature aspen and scattered cottonwood along the Middle Fork John Day River and its tributaries. Regeneration of these species is poor. Hardwood habitats are of particular importance

to the Lewis' woodpecker and the sapsucker species. The deficiency in this habitat is likely adversely impacting populations of these species within the analysis area.

3.2.6.4.6—Culturally Significant Plants

While Southeast Galena Analysis area may not be an area of concentrated plant use by nearby tribes, several culturally significant plant species occur in small populations. Big huckleberry (*Vaccinium membranaceum*) is the most common. Fire suppression, dense canopy cover in overstocked conifer stands, and intensive browse levels currently combine to limit the extent of productive huckleberry patches.

Chokecherries (*Prunus virginiana*) are not widespread, but at least one productive population along the river offers fruit sources, and has yielded seed for future replanting efforts throughout the watershed. Most plants occur along smaller streams and primarily where rock outcrops or steep terrain limit browsing access by deer, elk and cattle, but many of these plants are not large enough to produce fruit.

Plants such as onions (*Allium species*), biscuitroot (*Lomatium species*), yampah (*Perideridia species*), and bitterroot (*Lewisia redeviva*), are found on open scab flats. Bitterroot tends to prefer dry, rocky sites with little soil, and is the least common, probably because its preferred habitat is uncommon. While most are not highly palatable to deer, elk and cattle, all these root crops can suffer from overuse of scablands when large numbers of animals trample saturated soils and displace the roots. This effect tends to occur early in the growing season when vernal moisture is still present on many scabs.

*(See also **1.2.1.6 Undesired Condition: Degraded Wildlife** Habitat, page 18 **ISSUE 1.4.7—Blow down in Vincent/Vinegar** RHCAs, page 32; **ISSUE 1.4.8—Effects of Toxic Chemicals**, page 32;**ISSUE 1.4.9—Inadequate Amount of Treatment**, page 33;**ISSUE 1.4.10—Insufficient Pileated Woodpecker Habitat**, page 33; **ISSUE 1.4.11—Effects on Connectivity for** Wildlife, page 34; and **ISSUE 1.4.12—Effects of Managing Roadless** Areas, page 34.)*

3.2.7—NOXIOUS WEEDS

Approximately 65 acres of noxious weeds (including 15 different species) have been inventoried within the watershed, and will be treated manually, biologically, or chemically under the forest Weed EA. Recently discovered sites within the analysis area cover a total of 1.9 acres at 10 sites. Two species of knapweed are the most aggressive and the most likely to spread rapidly on newly disturbed ground as their seeds are carried easily on the wind. Canada thistle is the most common and widespread, and tends to be associated with riparian habitats. All other species are present in very small patches, and are most often associated with road right-of-ways and other disturbed sites such as log landings and skid trails. Three infested sites are in rock quarries from which road surfacing materials may be spread throughout the project. These sites are of particular concern as potential sources of seed dissemination.

Table 112 Noxious Weed Species Present.

Species	Common Name
Carduus nutans	musk thistle
Centaurea diffusa	diffuse knapweed
Centaurea maculosa	spotted knapweed
Centaurea solstitialis	yellow starthistle
Cirsium arvense	Canada thistle
Euphorbia esula	leafy spurge
Hypericum perforatum	St. Johnswort/ goatweed
Linaria dalmatica	Dalmatian toadflax
Linaria vulgare	yellow toadflax
Senecio jacobaea	tansy ragwort

All ground-disturbing activities such as trail construction, road construction, logging, grazing, and fire line construction for prescribed burning and wildfires can create soil and habitat disruptions that encourage invasion by noxious species. These actions are amenable to mitigation in the form of seeding with native or non-persistent, non-native plant species to provide rapid competition that will exclude noxious weed establishment. However, such preventive measures are not absolute, and some new infestations will appear, especially if the disturbance is widespread. Open ground is most susceptible to invasion by exotics for 2 to 3 years, or until plant cover is well re-established. The possibility of eradicating an infestation decreases rapidly with each year that seed is allowed to set, and the cost of doing so increases proportionately.

Of particular concern in this project are the “roadless” acres. Because they currently receive little impact besides grazing, opportunities for weeds to spread are limited. Surveys from 2000 indicate there are only a few known populations of noxious weeds within the roadless area, and these are primarily around the perimeter. However, without roads for easy entry, recommended ground and vegetation disturbing activities may create new infestations that are difficult to find, as well as to access for eradication treatments.

It should be recognized that infestation by noxious weeds does not necessarily follow the creation of newly disturbed seedbeds. Many early seral species will revegetate freshly disturbed soils, some of them weedy, but few of them designated as “noxious.” But the very invasive nature of noxious species means they are likely to spread quickly once established. At this point in time, the MFJD watershed has relatively few and small populations of noxious weeds, and the object of treating them is to maintain, or preferably improve on, that status in order to minimize seed sources from which the weeds can spread.

*(See also **1.2.1.7 Undesired Condition: Noxious Weeds** are Present, page 20; **ISSUE 1.4.8—Effects of Toxic Chemicals**, page 32; **4.3.8—**, page 365)*

3.3.0 ROADLESS CHARACTER

Portions of two Malheur *Land and Resource Management Plan* inventoried roadless areas[65] are located within the analysis area: The Dixie Butte roadless area comprises about 7,865 acres on the south side of the analysis area and the Greenhorn Mountain roadless area comprises about 6,519 acres on the north side of the analysis area. The *Land and Resource Management Plan* allocated acres in the Dixie Butte and Greenhorn Mountain roadless areas to several management areas MA 1 and 2-General Forest/Rangeland, MA 21-Wildlife Emphasis Area with Non-Scheduled Timber Harvest, MA 14-Visual Corridors, and MA 13-Old Growth (see 1.5.2 Planning Documents, page 36, also see, Appendix E, Map 3—Management Areas and Roadless Areas). The two roadless areas are described in this Chapter are based on nine roadless characteristics defined in CFR 36 CFR 294.11. The nine characteristics are:

1. High quality or undisturbed soil, water, and air
2. Sources of public drinking water
3. Diversity of plant and animal communities
4. Habitat for threatened, endangered, recommended , candidate, and sensitive species (TES) and for those species dependent on large, undisturbed areas of land
5. Primitive, semi-primitive non-motorized and semi-primitive motorized classes of dispersed recreation
6. Reference landscapes
7. Natural appearing landscapes with high scenic quality
8. Traditional cultural properties and sacred sites
9. Other locally identified unique characteristics

3.3.1—Dixie Butte Roadless Area

The Dixie Butte roadless area is located in the southern portion of the analysis area; the roadless area extends beyond this analysis area's boundaries. It consists of Dixie Butte (elevation 7,592 feet) and surrounding drainage tributaries to the Middle Fork of the John Day River and the main stem John Day River. Dixie Butte is a prominent landmark above surrounding forested areas. Side slopes are steep at higher elevations and bench-like at lower elevations. About 94 % of the area is forested. About 65% of the roadless area falls within the analysis area.

Characteristic 1—*High Quality Resources*

Resources have been somewhat degraded. Impacts from historic railroad logging, truck logging, mining, and sheep grazing are still visible.

Logging primarily occurred in the lower elevation Dry and Moist Forests where about 30% of the roadless area has been altered. Most of the overstory pine and western larch were removed. Fire suppression has allowed grand fir and Douglas-fir to increase, shifting the species composition on these once predominant pine sites. Tree stocking is high. Vegetation is considered outside the

[65] See this document Appendix M, Map___). See also "Roadless Area Descriptions and Disposition," in the Malheur National Forest *Land and Resource Management Plan*, Appendices FEIS, Appendix C, Dixie Butte roadless area C-32; and Greenhorn Mountain roadless area C-72)

Historic Range of Variation (HRV). The fire regime is no longer one of high frequency/low intensity fires. Some of the logging railroad grades and roads are grown over and slowly healing.

Generally, the upper elevation Cold and Moist Forest types have not been managed or logged with the only alterations coming from livetsock grazing and fire suppression. These activities allowed tree stocking to increase and fuels or slash to accumulate. Despite these alterations, vegetation conditions close to the HRV. These areas still support the high intensity/low frequency fire regimes expected in these Forest types.

Water resources have been impacted by old railroad access, sheep grazing, mining, and irrigation ditch lines which altered water flows.

Characteristic 2—*Public Drinking Source*

The Dixie Butte roadless area does not serve as a public drinking source.

Characteristic 3—*Plant/Animal Diversity*

The tree vegetation is diverse due to elevation and soil type change. The area includes all Forest Types (Cold, Moist, Lodgepole, and Dry Forest types). Cold Forest types are located on the upper slopes of Dixie Butte and include subalpine fir, Engelmann spruce, and white bark pine. Moist Forest types are located in the mid-elevations and are primarily composed of grand fir, western white pine, Douglas-fir, western larch, lodgepole pine, and Engelmann spruce. Lodgepole types are generally small and scattered. Dry Forest types occupy the lower elevations and are dominated by ponderosa pine, Douglas-fir, grand fir, and western larch.

Western white pine has a much narrower distribution than other conifer species, and is naturally absent from much of the Malheur National Forest. White pine growing in the Dixie Butte area is considered to be at the edge of its range. White pine has decreased in abundance. Bark beetles and white pine blister rust are killing mature trees. Dense stands resulting from fire exclusion limit regeneration; white pine regenerates well after a fire, which opens up the forest canopy allowing germination and regeneration.

Understory vegetation includes grasses, forbs, and shrubs, but species diversity is relatively low. A sagebrush area near the top of Dixie Butte is unique to the Dixie area, however, as you travel down the Middle Fork of the John Day River, sagebrush becomes more prevalent.

The diversity of Forest types and natural openings creates a diversity of habitat types. The area supports a variety of Threatened, Endangered and Sensitive Species (TES), Management Indicator Species (MIS) and Species of Interest (SOI) (see 3.2.6 Wildlife Habitat, beginning on page 165, for a list wildlife species and the management categories that apply respectively to theses animals). The area also supports a variety of other terrestrial species including cougar, black bear, bobcat, and other small game mammals.

Much of the roadless area is in the Dixie Butte Wildlife Emphasis Area, as designated by the *Land and Resource Management Plan*. The roadless area contains three Dedicated Old Growth Areas (DOGs) and one northern goshawk Post-Fledging Area (PFA). The area provides summer and winter range for mule deer and Rocky mountain elk.

Wildlife diversity is likely lower than occurred historically. The Dry and Moist Forests are outside of HRV as described under Characteristic 1. Old Forest Single Strata (OFSS) is deficient and well below historic levels due to management activities. This has likely reduced populations of species that prefer open park-like stands of large ponderosa pine. Species such as the white-headed woodpecker, Lewis' woodpecker, flammulated owl, and chipping sparrow have likely seen population decreases.

A number of drainages supporting fish populations have their headwaters in the Dixie Butte roadless area. The Butte, Little Butte, Deerhorn, and Davis Creeks flow north into the Middle Fork of the John

Day River and provide spawning and rearing habitat for steelhead and redband trout. Some of the streams provide rearing habitat for Chinook salmon.

Characteristic 4—*Large, Undisturbed blocks of TEPCS (Wildlife Habitat)*

The area includes habitat for Threatened, Endangered and Sensitive (TES) species, particularly those species dependant on large, undisturbed areas of forest. Habitat has the potential to support such species as gray wolf, Canada lynx, California wolverine, and Pacific fisher. Currently, California wolverine is likely the only one of these TES species to inhabit the area. The area lies within the Southeast Galena Lynx Analysis Unit (LAU), and includes denning and foraging habitat that could support Canada lynx.

The upper elevation Moist and Cold Forests contain large contiguous blocks of old forest multi-strata (OFMS) with few roads. This area represents the historic, or near historic vegetation and fire regime for these Forest types. These Forest types also contain the best habitat for the TES species listed previously. Although the lower elevation Dry and Moist Forests have been altered from past activities, stand structure and canopy closure is now somewhat homogeneous due to overstocking and tree species conversion.

The area contains habitat for TES fish species as described under Characteristic 3. Area streams support steelhead, redband trout and Chinook salmon.

No TES plants have been identified.

Characteristic 5—*Dispersed Recreation*

There are about 7,865 acres of Dixie Butte Roadless Area within the Southeast Galena analysis area. Of that acreage, 71% is semi-primitive motorized, 27% is roaded natural, and 2% is roaded modified. The Davis Creek Trail, which permits motorized travel, bisects the roadless area. Current recreational uses include hiking, cross-country skiing, snowmobile riding, hunting, prospecting, camping, and sightseeing. Area streams provide opportunities for resident trout fishing.

Characteristic 6—*Reference Landscapes*

The higher elevations Cold Forest and Moist Forest types represent what may have been historic conditions in these Forest types, and therefore may provide a reference landscape. The Dry Forest types and the lower elevation Moist Forest types have been sufficiently altered that they no longer provide a reference landscape. The most noticeable impacts are from timber harvest, unimproved roads, livestock grazing, and mineral development.

Characteristic 7—*Natural Appearing, Scenic Landscape:*

From a distance, the Dixie Butte area appears to have an unaltered, high scenic quality condition. The upper elevation Cold and Moist Forest types support a fairly natural appearing landscape. In the low elevation Dry and Moist Forest types, management activities are apparent as described in Characteristic 1, particularly when viewed close up or while walking through the area.

Characteristic 8—*Traditional Cultural Properties and Sacred Sites*:

There are no known or recorded properties or sites at this time.

Characteristic 9—*Other*

An area near the summit of Dixie Butte is being considered as a Resource Natural Area.

In MA 1 and 2-General Forest/Rangeland: Managing for timber production and other multiple use is permitted on a sustained yield basis (MA 1) and managing for livestock forage production and other multiple use is permitted on a sustained yield basis (MA 2). Dry forest types and low elevation Moist Forest types are outside HRV exhibiting high hazards that tend toward the likelihood of uncharacteristically severe wildfire occurring in these areas (see .

3.3.2—Greenhorn Mountain Roadless Area

The Greenhorn Mountain roadless area is located in the northern portion of the analysis area. This roadless area is located on both the Malheur and Umatilla National Forests and in both Grant and Baker Counties. The roadless area extends along the divide between the Middle and North Forks of the John Day River, where glacially carved granite meets Columbia Basalt formations. About 87 % of the area is forested.

Most of the area is on or near ridge tops and is comprised of an undulating terrain of forested areas and alpine meadows. Below these ridge tops, however are sharp breaks in the terrain, particularly to the north, with dramatic, sharp rock cliffs dropping away to steep drainages below. Generally, the area is south facing and tends to be a drier environment.

The Greenhorn Mountain Roadless Area is technically a roadless area; however it is bisected by Forest Road 2010 and old mining access roads. This road accesses the Vinegar/Indian Rock Scenic Area and Vinegar Hill. About 40% of the roadless area falls within the analysis area.

Characteristic 1—*High Quality Resources*

Historic railroad logging, truck logging, mining, sheep grazing, and recreation use have altered resources.

Logging has been relatively light. A minor amount of railroad logging and truck logging occurred along the edges of the roadless area, primarily in the Dry Forest types. Dry Forest types and their expected fire regime are outside HRV as described for the Dixie Butte roadless area, Characteristic 1. The remainder of the forested area is relatively untouched by timber harvest. Generally, the upper elevation Cold and Moist Forest types have not been managed or logged with the only alterations coming from sheep grazing and fire suppression. These activities allowed tree stocking to increase and fuels or slash to accumulate. Despite these alterations, vegetation conditions remain relatively similar to historic conditions. These areas still support the high intensity/low frequency fire regimes expected in these Forest types.

The greatest impact to the Greenhorn roadless area occurred from past mining development and associated access roads; there is some evidence of seepage coming from some of the old mining locations. Grazing, in particular past sheep grazing, has affected the higher elevation areas, partially denuding these areas of ground vegetation and compacting the soils. Sheep grazing ended in the 1940's. Although ATV use is considered prohibited, there is some evidence of current use. Many of these activities are limited to small, localized areas with the roadless area.

Characteristic 2—Public Drinking Source

The Greenhorn Mountain roadless area does not serve as a public drinking source.

Characteristic 3—Plant/Animal Diversity

The tree vegetation is diverse due to elevation and soil type change. The area includes all Forest types (Dry, Moist, Lodgepole, and Cold Forest types); however, the Dry Forest type is fairly limited because so much of the area is at the higher elevations. Generally, tree species are as described for the Dixie Butte roadless area, Characteristic 1, although the Greenhorn area supports far more Engelmann spruce and very little western white pine. Spruce bogs are scattered. Forest stands along both sides of the ridge dividing Little Boulder Creek and Windlass Creek are in poor condition due to spruce budworm defoliation, fir engraver, and root rot resulting in heavy fuel accumulations making for a very high fire risk.

Understory vegetation includes grasses, forbs, and shrubs; species include alpine sagebrush, alpine fescue, pine grass, elk sedge and huckleberry.

Soil types include serpentine and granite soils. Some soil types found in Greenhorn limit plant life.

The diversity of Forest types and natural openings creates a diversity of habitat types. The area supports a diversity of Threatened, Endangered and Sensitive Species (TES), Management Indicator Species (MIS) and Species of Interest (SOI) See 3.2.6 Wildlife Habitat for a list of wildlife species beginning on page 165. The area also supports a variety of other terrestrial species including cougar, black bear, bobcat, and other small game mammals. The unique alpine habitat provides an opportunity to view uncommon bird life such as pine grosbeaks and northern three-toed woodpeckers.

The roadless area contains five dedicated old growth areas (DOGs) and one northern goshawk post-fledging area (PFA). The area provides summer range, and a small amount of winter range, for mule deer and Rocky mountain elk.

A number of drainages with headwaters in the Greenhorn roadless area contain fish populations. The Vinegar, Little Boulder, and Granite Boulder Creeks flow south into the Middle Fork of the John Day River and provide spawning and rearing habitat for steelhead and redband trout. Some of the streams provide rearing habitat for Chinook salmon. Granite Boulder Creek provides spawning and rearing habitat for bull trout.

Characteristic 4—*Large, Undisturbed blocks of TES (Wildlife Habitat)*

The area includes habitat for Threatened, Endangered and Sensitive (TES) species, particularly those species dependant on large, undisturbed areas of forest. Habitat has the potential to support such species as gray wolf, Canada lynx, California wolverine, and Pacific fisher. Currently, California wolverine is likely the only one of these TES species to inhabit the area. The area lies within the Southeast Galena Lynx Analysis Unit (LAU), and includes denning and foraging habitat that could support Canada lynx. A Key Linkage Area (KLA) for large, wide-ranging carnivores is recommended through the roadless area.

The upper elevation Moist and Cold Forests contain large contiguous blocks of old forest multi-strata (OFMS) with few roads. This area represents the historic, or near historic vegetation and fire regime for these Forest types. These Forest types also contain the best habitat for the TES species listed previously.

Drainages with headwaters in Greenhorn contain populations and habitat for TES fish including steelhead, redband trout, Chinook salmon, and bull trout as described under Characteristic 3.

There are some sensitive plants primarily associated with riparian areas in the headwaters areas. Greenhorn has plenty of potential habitats for sensitive plants, but all sites are likely not identified.

Characteristic 5—*Dispersed Recreation*

About 6,519 acres of the Greenhorn Roadless Area are located within the analysis area. Of that acreage, 66% is semi-primitive motorized/semi-primitive non-motorized, 32% is roaded natural, and 2% is roaded modified. Trails include the Princess, Black Eye, and Tempest Mine trails. Current uses include hiking, cross-country skiing, snowmobile riding, hunting, prospecting, camping and sightseeing. Area streams provide opportunities for resident trout fishing.

Characteristic 6—*Reference Landscapes*

The higher elevation Cold Forest and Moist Forest types, alpine meadow systems, and serpentine areas are potential reference landscapes. Generally, past management activities identified in Characteristic 1 are limited to small, localized areas within the roadless area.

Characteristic 7—Natural Appearing, Scenic Landscape:

The area shows some evidence of human use and activities, but this remains substantially unnoticeable. Overall, the area remains a large, relatively unspoiled tract of land. The most intrusive impacts would be the unimproved roads and mining activity.

***Characteristic* 8—*Traditional Cultural Properties and Sacred Sites*:**
There are no known or recorded properties or sites at this time.

Characteristic 9—*Other*
The Vinegar Hill/Indian Rock Scenic provides high scenic values and recreation opportunities. No other unique features exist.

3.4.0—Human Use

3.4.1 History of the Analysis Area

Human activity and natural resource use in the Galena watershed has probably been occurring for at least the last 10,000 years. Prior to Euro-American settlement, people utilizing the watershed were engaged strictly in a hunting and gathering economy. Ethnographically, the primary occupants of the watershed were the Northern Paiute who wintered near Prairie City and Canyon City; although tribes from the Columbia Plateau such as the Umatilla, Tenino, Cayuse, Walla Walla, and Nez Perce also periodically visited the area.

The introduction of Euro-Americans occurred in the mid 1820s as fur trappers and explorers moved through the region. The discovery of gold near Canyon City in 1862 brought a heavy influx of miners and settlers to the John Day basin during the 1860s. Subsequent historic activities in the watershed included homesteading, ranching, railroad logging, and early Forest Service administration.

Evidence of these activities is in the form of archaeological sites that have been documented in the watershed since 1980. These properties include sites that have been evaluated as eligible for the National Register of Historic Places (NRHP) or potentially eligible (and require further evaluation for conclusive determination).

Over one hundred years of land and resource use in the analysis area, in the form of placer mining for gold, railroad logging, grazing of large herds of sheep and cattle and fire exclusion policy has altered the character of the analysis area. In more recent decades, timber management, camping, hiking, fishing, hunting, antler and mushroom gathering, firewood and other wood products, collecting, grazing, and permitted special uses have steadily risen as public interest in them increases.

Mining

Settlement of the Galena watershed began in 1864 with the discovery of placer gold near Elk Creek (Rossiter 1871). In the analysis area, miners used a method of large-scale placer mining called simply '*Hydraulic*,' a term made-up at the time of its use, this method of hydraulic mining was used widely across the Blue Mountains and in the analysis area. This method consisted of systems of flumes and ditches constructed to carry water from the upper reaches of the area streams in a manner that allowed water to be directed by gravity, and fall at a tremendous rate of speed. Then under great pressure was the water was directed from the flumes into a nozzle, called a '*monitor*,' or sometimes called a "*Giant,*" then a high pressure stream of water was used to literally wash away all potential gold-bearing gravels (Watkins, 1971). The result was that much of the soil was washed downstream leaving heavily altered landscapes with deep gullies, washed-out stream banks, and rock piles in streams. Past mining activities of this type have heavily impacted the configuration of many streams and the vegetation composition of stream "edge," within the analysis area.

The major focus of mining remained on the various forms of placer mining until the transcontinental railroad connected with Baker City in 1886 (Lindgren 1901). The improved transportation sparked a hard rock mining boom throughout the Blue Mountains as it suddenly became economically feasible to ship lower grade ores to smelters in Tacoma and San Francisco. The largest hard rock, or lode,

mining operation in the Southeast Galena Analysis area was the *Morning Mine* in the Vinegar Creek drainage. The *Morning Mine* consisted of more than 1200 feet of underground workings and at least one cabin, a blacksmith shop, and a stamp mill on a group of eight claims (ODGMI Bulletin 39, 1948). The *Morning Mine* was located in 1898 and was sporadically active until the government ordered a halt to all gold mining in 1942.Threr were a number of other mines, primarily located in the Vinegar Creek and Blue Gulch drainages. In the late 1890s, a stamp mill was installed at Psyche Butte to process ore taken from mines in the Greenhorn area. In 1933, the *Timms Dredge* began working the gravel of the Middle Fork near Galena, where it stayed until 1939. The dredge was moved to the Dewitt Ranch in the fall of 1939 where it operated until the World War II mining moratorium. The *Timms Dredge* processed about 2500 yards of gravel a day and employed 20 men (ODGMI Bulletin 14-B, 1941). The Lemmon cabin in the Granite Boulder Creek subwatershed is an example of a mining residence and smaller scale mining activity in the 1920s. The cabin was built in the mid 1920s by Ira J. Lemmon to work a gold claim.

Historic mining activity has straightened channels in some stream segments that formerly had a natural tendency to meander through the watershed. This historic activity also reduced the presence of large log barriers, which acted to keep water moving more slowly through the landscape of the watershed. These past effects created low sinuosity (the lack of a natural meandering nature with a slower movement of water off the landscape) and low levels of woody debris. This change has been a contributing factor to cause water to move off the landscape more rapidly than it once did, prior to Euro-American settlement. This mining activity of the past has reduced available water for late seasonal flows, reducing water table recharge, and has caused a reduction in riparian shade as well. Late summer and early fall movement of both wildlife and fish depend upon the availability of water during these critical months. This lack of a meandering nature (or sinuosity), pool frequency, and bank vegetation has resulted in higher water temperatures and fewer cool havens during hot weather, that in turn result in diminished hiding cover from predators for both wildlife and fish. Bull trout populations that were present across the analysis area, in many of the streams are present now only in the coldest of analysis area streams (see Analysis Area Stream Overview, page 131).

Past mining activities have located many significant mineral deposits, however mining and exploring for locatable mineral resources does continue in the AnalysisArea. “Locatable mineral deposits on public domain lands may be prospected for and extracted under the 1872 mining law, as amended and supplemented,” (Appendix F, LRMP). All mining activities are subject to applicable laws. There are active claims in the project area that could become active in the future. Recreational mining (gold panning) continues through the present day.

Logging

The Sumpter Valley Railroad reached the town of Austin in 1905 (Ferrell 1967). The Oregon Lumber Company (OLC) constructed narrow gauge railway from the town of Bates down the Middle Fork of the John Day River toward the mining towns of Susanville and Galena in 1916. The OLC spurs in the project area were used between 1917 and 1947, (see Appendix E Map 4—Historic Railroad Logging) and during this period harvest removed most of the large diameter ponderosa pine, western larch, and Douglas fir trees as well as snags. Past logging within Riparian Habitat Conservation Areas (RHCAs) reduced canopy cover within these important areas, resulting in less shade over streams. Railroad logging gave way to subsequent increases in road construction and road use associated with harvest, affecting streams within the project area (see 1.2.1 Undesired condition, page 11). Additionally, road segments constructed only for harvest acted as sediment sources, delivering increased loads to downhill portions of neighboring streams. Poor road location, improper construction, inadequate culvert size and culvert functioning capacity, as well as a lack of regular road maintenance are examples of conditions that have contributed to sediment problems and have

had impacts with every harvest. In the uplands, the use of skidding equipment for harvesting timber creates soil compaction and disturbance that has contributed to sediment in streams causing related problems. These same actions have decreased soil and moisture-holding vegetation, and in some instances may have decreased soil productivity.

Past logging techniques, in addition to fire suppression, has added to the change in vegetative composition in terms of tree species mix, and stand density. These changes from past actions have changed structural stages and age classes as well. This has had an effect across the landscape of reducing fire resistant trees and allowing more fire intolerant trees to proliferate across the landscape. This changed composition, which exists across the Southeast Galena project area has also created a condition where forest stands, which were once fire-adapted forests, but now have become overstocked stands that are less resistant to insect infestation, disease infection and uncharacteristically severe wildfire. Consequently, change of other vegetation components in competition for nutrients and sunlight has reduced growth of native shrubs and grasses because denser forest stands now dominate the landscape.

Grazing

Grazing has had a major influence on the watershed—not only by domestic livestock, but also grazing by deer and elk. Grazing of large herds of sheep and cattle was a historic use of the project area. Sheep were a major part of grazing in the watershed until about the 1940s. Since then, the majority of grazing has been by cattle. Both sheep and cattle grazing utilized available forage in a "continuous seasons" grazing regime.

Fire Exclusion Policies and Fire regimes

Following Euro-American settlement, fires were suppressed (at least 75 years of fire suppression) and the disturbance regime was altered. Now, particularly, in the Dry Forest types of the project area the fire resistant ponderosa pines are surrounded by younger trees which escaped fire (because of suppression policy for the past 75 years) when these trees were smaller (Hall 1976). Before settlement, forest stands were less susceptible to intense fires and less susceptible to disease and pest epidemics than they are today. These early forest stands were more open and park-like and were comprised of large trees of the early seral species, Ponderosa pine and western larch.

Photo 19—Before settlement and fire exclusion policies began, wildfire in the early forests of the project area typically ran through the understory thinning out most encroaching climax species of Douglas fir and grand fir while the larger early seral species of Ponderosa pine and western larch became dominant.

These tree species had a large overstory component and exhibited a resiliency toward natural disturbances such as wildfire, or insects and disease causing forest pathogens. Records indicate that in early seral forests, disease and insect infestations were less prevalent, and wildfires were significantly smaller. Wildfire in these early forests typically ran through the understory thinning out most encroaching climax species of Douglas fir and grand fir while the larger early seral species of Ponderosa pine and western larch remained relatively unharmed due to their large size, thick bark and the relative open spacing. Additionally, the role of wildfire in these forests before settlement, was characterized by a beneficial invigorating effect to the shrub and plant communities of the forest understory (see3.2.4 Vegetation by Forest Type, page 139, and 1.2.1.4 Undesired Condition: Vegetation Outside Historical Range of Variability, page 14). This fire regime is beneficial to wildlife and wildlife habitat by causing additional vegetative growth that patterns a mosaic effect of open stands of trees with occasional openings across the landscape (see also 3.2.5 High Wildfire Hazard, page 159).

3.4.2 Austin, Bates and Greenhorn

Located on the eastern edge of the Southeast Galena project area, the town of Austin, Oregon, founded in the later part of the 19th century. The railroad reached town in 1905. Austin was once home to the "Austin House," stage stop, on the route to Baker City from John Day. The residents were originally mostly miners, ranchers and loggers. Austin was the hub of this area, until the town of Bates was founded one mile west of Austin with a sawmill. With the building of the sawmill, the community of Bates, Oregon became a thriving timber town that served the railroad logging industry with a general store, tavern, post office, hotel, two churches, and an elementary school. The town was built around a sawmill owned by the Oregon Lumber Company and, later, the mill was sold to the Edward Hines Lumber Company. Historically, this community provided the economic hub for the employees of the Blue Mountain Ranger District (not the current Blue Mountain Ranger District) which was part of what was once the Whitman National Forest. Additionally, employees of the Austin Section of the Oregon State Highway Department, local miners, ranchers, residents of the communities of Galena and Susanville, as well as the remaining residents of the town of Austin formed the community of Bates. Logs were delivered to the Bates sawmill by railroad from the early 1900s to the mid 1940s, then by logging truck until 1975. In the early 1970's, the Edward Hines Lumber Company changed their operations by building a more modern sawmill in the city of John Day, Oregon. Consequently, by late 1975 the sawmill in Bates was closed and the dismantling of both the town and the sawmill had begun.

Greenhorn served nearby mines in the late 1800s and early 1900s. currently there are several residences that are occupied mainly as summer homes. Greenhorn is an incorporated town, possibly one of the smallest in Oregon.

3.4.3 Social and Economic Factors

The social and economic analysis was conducted to describe the impacts of recommended alternatives for the Southeast Galena Restoration Project. The objective of the social impact analysis is to identify potential changes in people's social and cultural conditions that directly or indirectly result from Forest Service actions. The objective of the economic impact analysis is to identify potential impacts to economic conditions such as employment and income. The objective of the environmental justice analysis is to identify potential disproportionate impacts to minority populations, low-income populations and American Indian tribes. The objective of the financial and economic efficiency analysis is to describe economic uses and values and identify potential benefits and costs of alternative proposals for resource management.

Quantitative or qualitative variables or a combination of both related to the social and economic issues were selected to provide a comparison of effects between alternatives. The scale of analysis was determined from the issues and potential impacts surrounding the proposal. Depending on the cause and effect relationships surrounding an issue, the scope of the analysis and scale of interest may vary for each selected social or economic variable. Some overlap occurs between variables and subsequent scales of interest. For example, some issues are focused on community level effects while other potential impacts may be multi-county wide. Some issues reflect regional or national scales of interest.

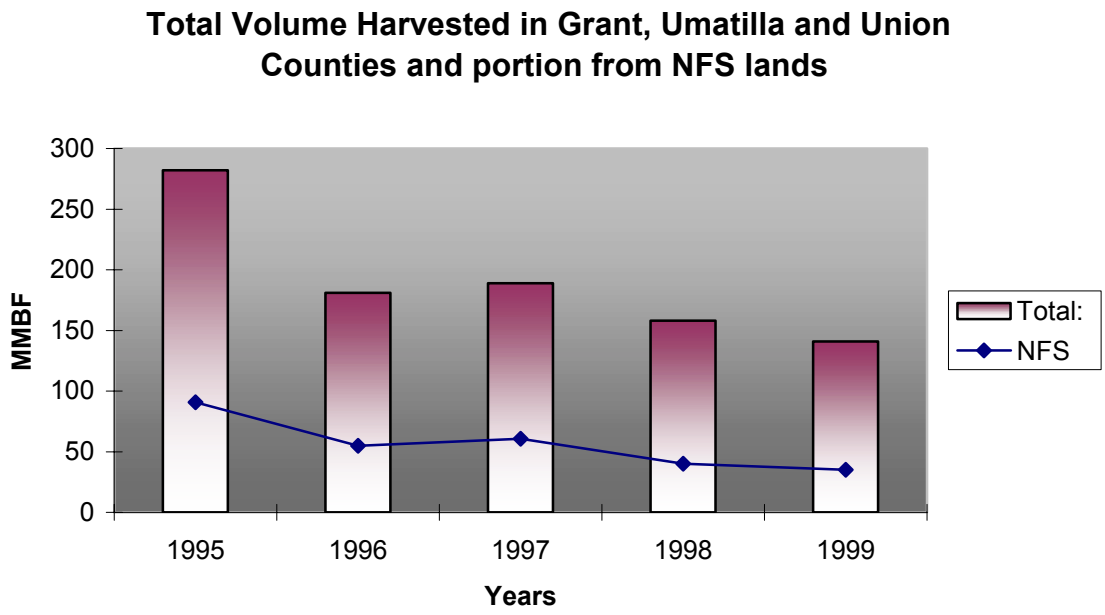
The project activities were examined in terms of categories of activities from Chapter 2.0, such as aquatics (streamside/riparian hardwood protection, planting, rehabilitation, etc.), vegetation (harvest treatments, logging methods, competing vegetation control, prescribed fire, aspen stands, etc.), and infrastructure (road construction, reconstruction, decommissioning, trail work, and removal of dispersed camp areas, etc.). A combination of trend extensions, comparison to findings in the literature, known studies and surveys, institutional experience with previous effects, and economic models were used to estimate the magnitude, duration and intensity of the impact.

Timber-Harvest Related Employment

Timber sales from the Malheur National Forest provide employment opportunities to local communities that are dependent on timber-harvest related employment. Based on log flows from the Malheur National Forest in 1998, mills in Grant, Umatilla and Morrow counties acquired most of the supply. Baker and Union counties acquired about 15 percent of the supply (Oregon Department of Forestry 2000). However of these counties, only Grant, Umatilla and Union counties currently have operating mills. These mills support approximately 705 jobs in associated communities including John Day, Prairie City, Pendleton, Pilot Rock, La Grande, Elgin and North Powder. These figures are subject to change based on modifications to plant operations since April 2001 (Ehringer and Associates 2001).

Total volume available to mills from timber harvesting in Grant, Umatilla and Union counties over the last five years (1995 to 1999) dropped by 50 percent from 282 MMBF to 141 MMBF. Harvesting from all National Forest System (NFS) lands in these counties has contributed between 25-30 percent (40 MMBF) toward the total annual harvest over the same period. The NFS average represents about 10 percent of the current annual production of mills in these counties (Ehringer and Associates 2001).

Figure 11 Total timber Harvest in Grant, Umatilla and Union counties



Logging and wood products related employment in Grant, Umatilla and Union counties has fluctuated over the last five years. Grant County employment in this industry has declined 22 percent, followed by a 17 percent decline in Union County. Umatilla County increased by 8 percent. The economic base of these Counties is predominately agriculture, ranching and forest products industries, with opportunities for tourism development. Grant County's economic base is agricultural services, wood production and federal government with local government, retail trade and services being the top employers in Grant County. Wood products and federal government provide 320 jobs each. Between the three counties in 2000, the lumber and wood products industry employed 1,970 people.

Table 113 Lumber and wood products employment

County	Lumber and Wood Products Employment				
Year	**1996**	**1997**	**1998**	**1999**	**2000**
Grant	440	410	360	360	320
Umatilla	890	910	1010	1020	760
Union	1,030	990	880	860	890

Table 114 Non-farm Payroll

Non-farm Payroll (Average Annual for 2000)	Jobs in Grant County	Jobs in Umatilla County	Jobs in Union County
Wood Products	320	760	890
Other Manufacturing	10	1170	720
Food and Kindred Products	0	2450	0
Construction/Mining	120	1390	330
Transportation/Utilities	140	1920	490
Wholesale Trade	70	1090	430
Retail Trade	460	5880	2150
Finance/Real Estate	100	810	380
Services	360	5500	2060
Federal Govt.	320	830	230
State Govt.	120	1680	1060
Local Govt.	680	4500	1320
TOTAL	2700	27980	10060
Source: State of Oregon Employment Department,			

Declining trends in timber harvesting from National Forest System lands indicate that declines in wood products employment may continue over the next two decades. In the long-term (20-40 years), employment is predicted to stabilize and then increase matching timber harvesting increases. In response to agency decision about carrying capacity and resource protection, historic levels of livestock grazing continue to decline and are expected to decline over the next 20 years. In the future, recreational use is expected to continue to increase as population continues to grow in the region and nationally demand for opportunities continues. Competition for water for hydropower production, irrigation, domestic water supply and instream flow needs is expected to become increasingly controversial and complex to meet the future needs of the ecosystem (Haynes and Horne 1997).

Table 115, illustrates average annual unemployment rates for the past five years in Grant, Umatilla and Union counties.

Table 115 Unemployment statistics

	1996	1997	1998	1999	2000
Grant	12.0%	13.5%	13.9%	12.3%	11.1%
Umatilla	8.4%	8.0%	6.3%	6.7%	6.4%
Union	7.8%	7.9%	7.1%	6.0%	5.2%

Grant County's annual average unemployment rate declined in each of the past two years. In fact, the 2000 annual average jobless rate of 11.1 percent was Grant County's lowest since 1995. However, the improvement in the jobless rate was due not to employment growth, but to people leaving the labor force. The annual average unemployment rate of 5.0 percent for 2000 was Union County was the lowest in the past 20 years. Umatilla County's rate of 6.4 percent was similar to the past three years (Oregon Employment Department 2001).

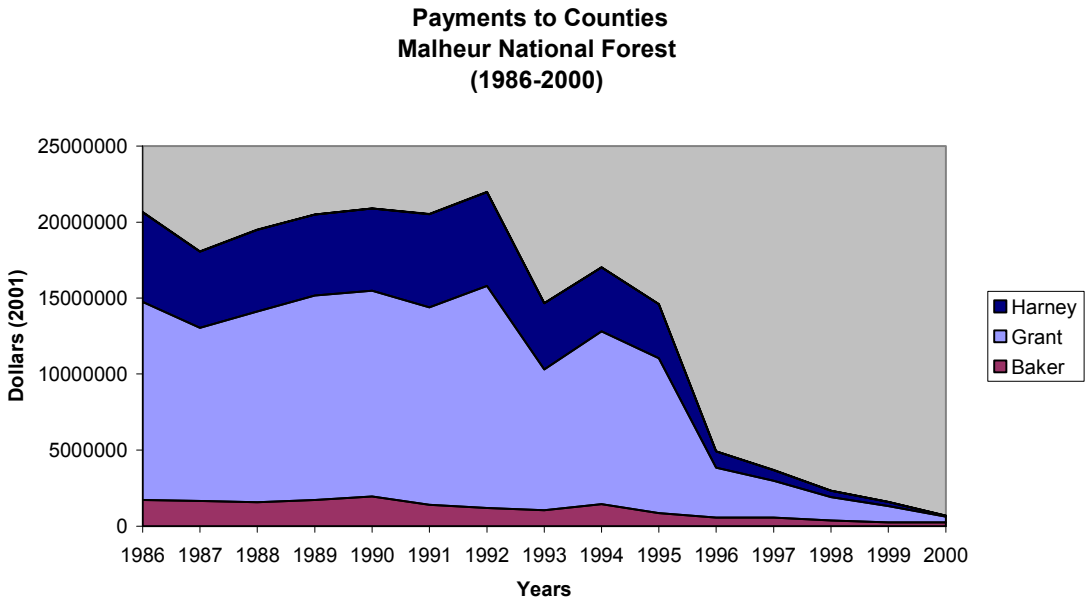
Restoration Opportunities For Local Communities

For purposes of this analysis, "community" describes the spatial location of groups of people living in the rural areas directly adjacent to the Analysis Area (Galena WA, Supplement—2002)or in surrounding Grant County. People are concerned about their ability to adapt to rapid changes such as mill layoffs or closures, and resulting changes in their social organization such as declines in school enrollment from peopling leaving the area to find work.

Declines in timber harvests over the past several years in response to changing national social values and protection of endangered species have subsequently contributed to significant declines in payment levels and the ability of communities to manage their education budgets. Historically, 25 percent of the gross receipts collected by the Forest Service from the use of National Forest System lands and resources (timber sales, grazing permits, campground fees, and other special use permits) were returned to the States as a source of funding for schools and roads. Payments to counties were based on the amount of National Forest System land within a county and comprise an important element of local budgets.

In response to this decline, on October 30, 2000, (Public Law 106-393), H.R. 2389, the Secure Rural Schools and Community Self-Determination Act of 2000 (Act) was signed into law by the President. Counties now have the option of continuing to receive payments under the 25 Percent Fund Act or electing to receive their share of the average of the three highest payments during the years from 1986 to 1999. Refer to the Figure 5 for an illustration of this trend.

Figure 12—Payments to Counties



Twenty-five percent of receipts collected from the Malheur National Forest are distributed primarily to Grant (77 percent) and Harney (20 percent) counties, with a portion allocated to Baker (3 percent) and Malheur (0.03 percent) counties. Malheur County payments are too small to be displayed on the graph.

Due to declines in timber harvests from federal lands in the last several years, several initiatives have evolved to build broader linkages between watershed restoration and healthy communities. In 1999, three million acres in the Blue Mountains was identified as the Blue Mountains Demonstration Area (BMDA) by Oregon Governor Kitzhaber, the Forest Service and over 40 partners to address restoration needs and community concerns. The mission of the BMDA emphasizes watershed restoration in high priority areas while promoting community health by providing "restoration-related employment and resource outputs that are sustainable and consistent with achievement and maintenance of healthy watershed conditions" (USDA 2001a).

Results of analysis on FY1998 and 1999 contracts in the Pacific Northwest indicate that almost half the contracts awarded by the Blue Mountains national forests (based on average award amounts per contract by distance and region) were awarded to firms more than 150 air miles away. Contractors residing in the coastal regions and Western Cascades of Oregon and Washington acquired the majority of the contracts and value (Moseley and Shankle 2001).

Contractors residing in communities surrounding the project area can provide a variety of skills and equipment for road maintenance, reconstruction and construction, culvert replacement, grapple piling, roadside brushing, fish passage, thinning, pruning, cone surveys, fencing, hand piling, and stand exams (USDA 2001c). Preliminary analysis of contracts awarded for these types of work on the Malheur National Forest indicates during the last three years (1998-2000), contractors residing in Grant and Harney counties received 34 percent of the total number of contracts. Reforestation work has provided 40-60 percent of the total value and is typically accomplished by contractors residing outside the area. The average annual dollar value of contracts awarded to 14 average annual local contractors was $372,953 (USDA 2001b).

Population Changes

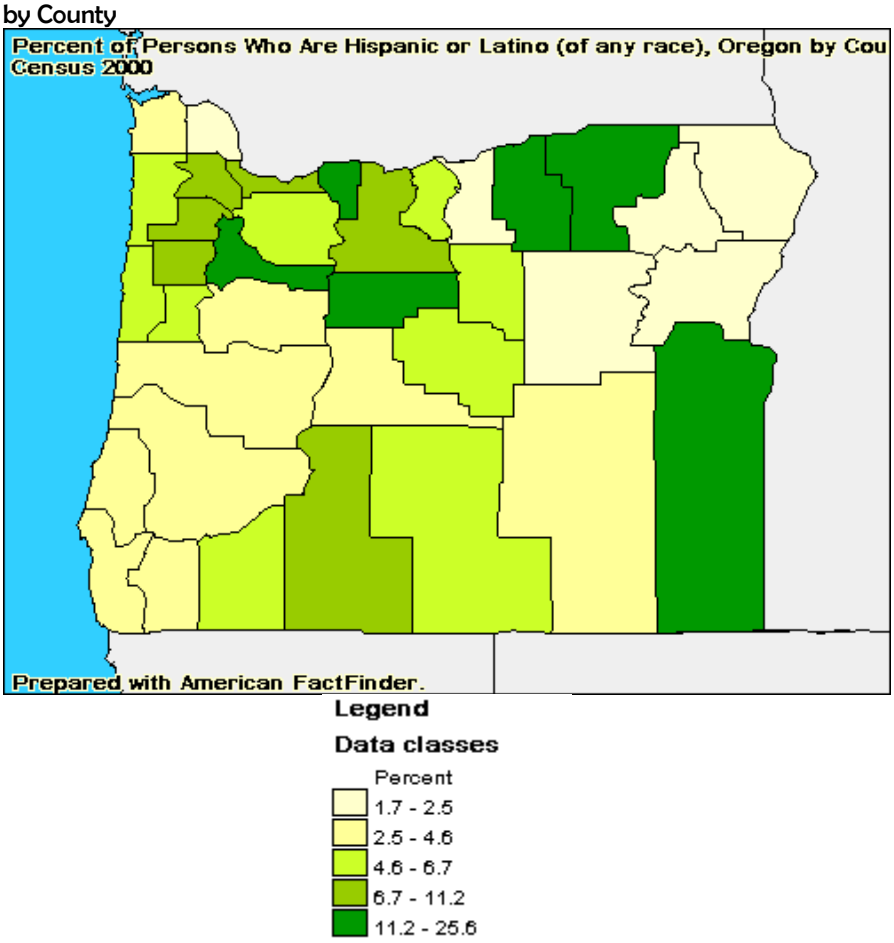
Humans have inhabited the area surrounding the Galena watershed for over 10,000 years. Several American Indian tribes occupied the area or participated in hunting and gathering as neighboring tribes. The primary groups included the Northern Paiute near Prairie City and Canyon City along with Columbia Plateau tribes such as the Umatilla, Tenino, Cayuse, Walla Walla and Nez Perce. European fur trappers and explorers arrived in the mid 1820s, followed by gold miners and settlers in the 1860s.

Residents of Grant County are concerned that past declines in timber-harvest related employment have caused people to move out of the area and affects school enrollment, property taxes and local business viability. Residents surrounding the project area in Grant County live within communities of less than 10,000 people, in unincorporated places, or in open countryside. Population growth in the immediate area has been fairly limited since the 1950's. For example, Grant County (population 7,935) has grown about one percent from 1990 to 2000. Harney County (population 7,600) located south of the project area has grown almost eight percent during the same period while Baker County (population 16,741) to the north has grown over nine percent. Umatilla County (population 70,548) directly north of the area has grown at 19.1 percent almost as fast as the statewide average of 20.4 percent from 1990 to 2000 (U.S. Census Bureau 2001).

Racial groups in the area are predominately white, followed by American Indians depending on the particular county. For example, Malheur County has a larger proportion of other races (25 percent) than Grant County (4 percent). Statewide, white persons represent about 89 percent of the population followed next by Asians (3.7 percent), American Indian/Alaska Natives (2.5 percent), Black or African American (2.1 percent), Native Hawaiian or Pacific Islander (0.5 percent), and other races (5.2 percent). Percentages add up to more than 100 percent because some people report for more than one race (U.S. Census Bureau 2001).

Racially, most Hispanics identify themselves as Caucasian depending on their ancestry that often includes African American and Native American. Hispanic refers to individuals from an ethnic background associated with Mexico, Cuba, Puerto Rico, South and Central American and other Spanish speaking countries. In Oregon, this segment of the population is expected to grow the fastest overall. The following figure illustrates the mixture of Hispanics as a percent of total county populations (Oregon Employment Department 1998).

Figure 8—Percent of Persons Who Are Hispanic or Latino (of any race), Oregon by County



Nationally, future trends in population indicate that as a result of immigration, the racial and ethnic populations will comprise nearly 50 percent of the total in 2050 compared to 18 percent in 1990 (USDA Forest Service 1999b). Some ethnic minorities prefer harvesting and use of nontimber forest products, hunting and fishing for subsistence use, and developed recreation sites to accommodate larger groups and these demands are likely to grow in the future (Cinnamon and others 1999, USDA Forest Service 2000).

Recreation Use

Recreation use in the watershed consists primarily of dispersed activities of viewing scenery, wildlife viewing, hiking, and hunting. Other year-round activities such as snowmobiling, cross-country skiing, ATV use, dispersed camping and horn hunting are also popular pursuits. Hunting big game animals (deer and elk) and fishing are also activities which are popular. Two developed recreation facilities (Middle Fork and Deerhorn) and about 118 dispersed campsites provide a range of opportunities in the area. Recreation places are easily accessed by combination of roads and trails to the project area. Dispersed camping occurs in several areas along streams within riparian areas.

The Davis Creek Trail in the south half of the watershed provides a roaded modified setting for hiking, horseback riding, mountain biking and motorized bikes. Current use of this trail by ATVs is creating unsafe or less than standard conditions for all users due to the narrow width and causing resource concerns at stream crossings. The Blackeye Trail in the Vinegar Hill-Indian Rock Scenic Area provides a semi-primitive, nonmotorized (summer) and motorized (winter) setting for hiking,

horseback riding, mountain biking and snowmobiling. Access to the trailhead and the adjoining Tempest Mine trails has been blocked by a road washout on FR 4559 for the past few years.

Use data on the level of recreation participation and experience levels is not available for the analysis area. Information on regional trends in the Columbia River Basin indicates that hunting, day use, camping, motor viewing and fishing are primary uses of the area (Haynes and Horne 1997). Residents of Oregon, Idaho, and Washington primarily seek these recreation opportunities. The project area provides a supply of primarily undeveloped roaded natural and semi-primitive motorized recreation settings and experiences. The Vinegar Hill-Indian Rock Scenic Area provides semi-primitive nonmotorized opportunities.

Demands for recreation on public lands in the Columbia River Basin region will continue in the future especially in undeveloped and remote settings. Participation in recreation activities in the Basin is projected to increase overall by 2.3 percent per year (Haynes and Horne 1997). Some activities have a higher predicted rate of growth. Participation in all types of recreational fishing nationwide is expected to increase by 36 percent by 2050. Big-game hunting is expected to increase through 2040 although small game hunting has been on the decline. Habitat protection measures and competition from nonnative species may have a greater impact on public participation in these activities in the future (Flather and Hoekstra 1989). Recreation use in the project area is expected to increase for ATVs, camping, and potential increases in trail use. Big-game hunting use will remain stable, but dependant upon Oregon Department of Fish and Wildlife controlled hunt regulations (the number of tags given out may fluctuate from year to year) and fishing use will slightly increase. Other activities such as horn hunting and mushroom collection for personal use will remain the same.

Expenditures for food, equipment, lodging, transportation, licenses and other expenses by recreationists in the project area benefit local communities and regional economies. For example, 20 percent of recreational fishing expenditures in the Columbia River Basin occur in eastern Oregon. Residents of the Basin generate about 70 percent of the fishing activity. Expenditures associated with fish viewing accounts for about $80 million per year in Columbia River Basin (Fluharty 1995). Total spending by visitors to northeastern Oregon has increased by 5.2 percent on average annually in the last ten years compared to a statewide total of 5.7 percent (Dean Runyan Associates 2001).

Nontimber Forest Products

People expressed concern about how the recommended activities would affect personal collection of nontimber forest products such as firewood, wild edible mushrooms and huckleberries. Changes in road access, trail access, harvesting activities, and wildfires would affect nontimber forest products habitat and user's access.

Nontimber forest products include five broad categories: wild food plants such as mushrooms, fruits, nuts and berries; medicinal plants and fungi; floral greenery and horticultural stocks; plants, lichens and fungi used for fiber and dyes; and other chemical plant extracts such as oils and resins. Woody materials such as firewood, post and poles, boughs are also commonly used nontimber forest products (Weigand and others 1999).

Commercial uses of these special forest or nontimber products is a small but growing industry in the Pacific Northwest and has been expanding from the Cascade Range to the eastside. Primary products include floral greenery, Christmas ornamentals, wild edible mushrooms, and other edibles (Schlosser and Blatner 1994). Recreational collection of wild edible mushrooms such as morels and chanterelles has developed into a major commercial industry. Wholesale mushroom companies processed $11.8 million dollars of mushrooms in the eastern portions of Oregon and Washington in 1992 compared to $26.8 million west of the Cascades.

Although data is limited wild edible mushroom harvesting generates seasonal employment. Numbers and duration of employment depend on conditions that are favorable to mushroom reproduction such as fires, but the industry continues to draw pickers, wholesalers, and processors. Asian and European markets purchase over 40 percent of the harvest, and delivery of the products within 24 hours is essential to gaining the highest value (Parks and Schmitt 1997). Conflicts between causal collectors and commercial mushroom pickers have occurred in the past and are likely to continue in the future. Some environmental effects have been reported due to heavy concentrations of pickers living in dispersed campsites on the Malheur National Forest (Volk 1991).

Nontimber forest products also contribute toward social values in terms of livelihood, cultural, and recreational (Emery 1999). For example, users enjoy collecting mushrooms purely for the adventure of finding them, they desire the fresh taste and texture, and participate in groups to collect and harvest as a traditional pursuit. Collection of other nontimber forest products in the project area includes firewood gathering by residents of Grant and Malheur counties, huckleberry picking, and post and poles harvesting. Many firewood gatherers depend on firewood to supplement or provide for subsistence needs for heating materials in the winter. Some users collect firewood either commercially or on a volunteer basis for seniors living in the area and as far away as Ontario.

Special Use Permits and Claims

Road decommissioning reduces access and may reduce these permitted uses. Special uses permitted in the project area besides uses associated with nontimber forest products include livestock grazing, electronic towers, powerlines and other related facilities. Water rights and mining claims also occur in the project area. There has been interest by members of the public in obtaining outfitting and guiding permits in the general area although none are currently permitted.

Livestock Grazing

Cattle grazing is authorized on the Upper Middle Fork allotment and part of the Granite Boulder unit of the Lower Middle Fork allotment in the analysis area. The Upper Middle Fork allotment has not been used for the last several years as a matter of personal convenience by the permittee. In 2000, a temporary permit was authorized for 100 cow/calf pairs to offset areas lost due to the Summit Fire in 1996. The Granite Boulder unit of the Lower Middle Fork allotment has not been used for livestock grazing since the fire. Livestock grazing is currently authorized on the unburned portions of the allotments. Refer to the “Range Resources” section of this DEIS for further information on the range allotments.

Ranchers with federal permits rely on forage from federally managed lands. Grant, Harney and Wallowa counties are highly dependent on forage where the value of cattle reared on forage from federally managed lands represents more than 10 percent of total agricultural sales (Horne and Haynes 1999). Shifts in permitted use of federal grazing allotments change the availability of this forage source. The impact these shifts have on the local economy varies according to the adjustments that local ranchers have to make within their ranch operation.

Individuals and families involved in ranching share social values for their independent lifestyle and hard work, they view their role as caretakers of the land, and attach a sense of identity to the land as their home and their lifestyle. Homesteading values and lifestyles are valid today although some changes have occurred that affect social values. Some ranchers have acquired larger land holdings and some families have outside income from other employment to make ends meet. Some families operate at a loss to maintain what they perceive is a desirable lifestyle (E.D. Hovee & Company 1995).

Grazing Allotments

Today, cattle grazing occurs on two allotments, the Upper Middle Fork and the Lower Middle Fork Allotment both of which are within the project area boundary. The Upper Middle Fork Allotment runs 473 cow/calf pair on 54,673 acres, the Lower Middle Fork Allotment runs 549 cow/calf pair on 58,161 acres. It is estimated that a similar number of cattle graze on privately owned pastures along the Middle Fork of the John Day River. Four ranches manage the private pasture. Two of these ranches (Oxbow and Dunstan) were recently purchased by the Nature Conservancy (and it is assumed they will be managed for wildlife habitat, not cattle production).

Past monitoring data shows that stocking rates are consistent with the amount of forage production within the project area. This data consists primarily of forage utilization data. The Malheur National Forest *Land and Resource Management Plan* specifies allowable use levels for rangeland forage. These allowable use levels were generally not exceeded within the Southeast Galena watershed since 1990. Recent monitoring data has shown isolated problems with excess forage use in areas that cattle tend to prefer. These are isolated problems, which are considered livestock distribution problems and are not due to a shortage of forage. Numbers of cattle authorized to graze the area have been adjusted over the years to keep livestock numbers well below levels, that could be supported by existing forage production. This assures adequate forage for both cattle and wildlife.

Photographs, condition and trend data and professional judgment lead to a conclusion that significant change has occurred over the past 150 years (Upper Middle Fork 2210 files). Prior to European-American settlement of this area, fire played a dominant role in shaping the landscape. Vast areas of open park-like stands of ponderosa pine have been converted to dense, overstocked, dead and dying stands of diseased forest which provide little in the way of forage for grazing animals. Conifers have, now encroached upon areas that were once open meadows and dry rangeland.

Rangeland conditions in the project area are slowly improving, however Primary Rangeland is decreasing. Over time, under current *Land and Resource Management Plan* grazing standards, a slow upward trend in the range condition would be expected. This trend has been established by review of literature and data from the 1930s to the present (USDA FS 1989). However, due to the continued encroachment of timber into the rangelands, the amount of forage available to livestock will gradually decrease over time. This will force livestock to concentrate on a continuously shrinking area of suitable rangeland. If more suitable rangeland is not created by future management projects, or natural disturbance, the number of livestock permitted to graze on this watershed will need to be decreased in the future to avoid unacceptable environmental damage.

Upper Middle Fork Allotment

The Upper Middle Fork Grazing Allotment occupies the majority of the project area. Currently 473 cow/calf pairs are authorized to graze the Upper Middle Fork Allotment from June 1 until October 15. The permittee choose to take non-use in this allotment the last several years for personal convenience, however there was allotment use in 2000. A temporary permit for 100 cow/calf grazed from June 15 to October 1, 2000 in the Caribou unit to make up for lost grazing areas due to the Summit Fire, an uncharacteristically severe wildfire which severely affected most of the Lower Middle Fork allotment. The burned portions of the allotments within the Summit Fire area have been excluded from grazing, through a management decision, for an indefinite period of time.

A deferred rotation grazing system is being used to manage the rangelands on the Upper Middle Fork Allotment. The allotment has been divided into 8 pastures by approximately 45 miles of fence. Two herds of livestock are moved through each of these pastures during the grazing season. Approximately 40 livestock water developments have been constructed on the allotment to provide

water for cattle. The primary purpose of these water developments is to improve livestock distribution by providing water for cattle in areas where water is scarce and to provide cattle with an alternative to watering in streams. These water developments and fences are maintained by the grazing permittee.

There are approximately 49 miles of fish bearing streams within the Upper Middle Fork allotment that support bull trout migratory habitat as well as steelhead migratory and spawning habitat. Through the consultation process for grazing allotments on the Middle Fork John Day River Sub-basin, a grazing monitoring plan and conservation measures are in place to offset the effects of grazing. *The Middle Fork John Day Biological Assessment for Range Allotments* (Malheur National Forest 2001) was prepared in cooperation with the U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) to address impacts caused by grazing on riparian systems and for compliance with Endangered Species Act of 1973 (ESA) criteria for bull trout and steelhead. This Biological Assessment is modified yearly, based on the end of year report so adjustments can be made to the conservation measures or grazing system.

Lower Middle Fork Allotment

Part of the Granite Boulder unit of the Lower Middle Fork Allotment is within the Southeast Galena Watershed, which is currently authorized to graze 549 cow/calf pairs between the dates of June 1 to October 15. The Granite Boulder unit has been rested since the Summit Fire burned in 1996.

The only stream in the Lower Middle Fork Allotment within the Southeast Galena watershed is Granite Boulder Creek. This stream has steelhead, bull trout and redband trout spawning areas. All streams within this grazing unit have been consulted in cooperation with the USFWS and the NMFS for compliance with ESA criteria for bull trout and steelhead. Determinations have been made and appropriate conservation measures applied to minimize impacts as stated in the Middle Fork John Day Biological Assessment for Range Allotments (Malheur National Forest 2001).

Facilities

Several overhead electric power lines and poles, buried telephone lines and above ground pedestals occur within or adjacent to the analysis area.

Water Rights

A number of irrigation and mining ditches branch off the Middle Fork of the John Day River and several of its tributaries. Rotary fish bypass screens have been installed and maintained by the Oregon Department of Fish and Wildlife at diversions in streams with anadromous fish. Water withdrawals are permitted under individual water rights filed with the State of Oregon. There are 12 ditch easements within the watershed.

Mining Claims

Today, minimal activity occurs although the watershed has the highest level of activity on the Forest. Mining landscape features such as placer tailings, waste rock piles, hydraulic ditch systems, prospect holes, audits, and shafts, are common throughout most of the subwatersheds in the analysis area. Mining related properties, such as cabins, flumes, and mills or other ore processing localities are also commonplace, particularly near historic claims. There is at least one vertical mine shaft, and several mine adits that are currently open. There are some old ore processing facilities on private land within the watershed. It is unknown if there are chemicals leaching from these and other mine tailings.

Attitudes, Beliefs and Values

People are concerned about protecting and restoring threatened and endangered species, and preserving values associated with enjoyment of the landscape. Management actions may affect people's attitudes, beliefs and value associated with ecosystems. Attitudes reflect people's evaluation of something as favorable or unfavorable. Beliefs reflect what people think is true about something and can be a reason a person has one or more attitudes. Values reflect what people consider to be precious to them. They represent goals or standards of behavior that form the basis for their attitudes and beliefs.

Understanding the attitudes, beliefs and values of the various members of the public, and balancing management decisions among a variety of opinions and interest regarding ecosystem management has changed over time. Anthropocentric views of the forest in which forests are valued because of their utility to humans have traditionally led natural resource management policies. In the past ten years, the biocentric view that people believe in protecting forests because they feel it is important independent of utilitarian motives has increased (Steel 1994).

These differences in views can generally be characterized as commodity and non-commodity values. Commodity values such as timber, minerals, water, and range often contrast with noncommodity values for recreational, ecological and spiritual and aesthetic values. In addition to wide ranging values, people share conflicting opinions about whether the environment should be actively managed to achieve outcomes people desire or passively managed by allowing nature to achieve its own course (Botkin 1990). Most people share a mix of values and perspectives.

Although no surveys of people have been completed for the Southeast Galena Restoration Project, public comments and concerns indicate a range of spiritual and aesthetic values associated with the area

Public opinion surveys are one source of information for understanding people's attitudes, beliefs and values. In a survey of Oregonians and national public and their values regarding natural resources, respondents identified protecting resources for future generations as the most important factor. The three most important factors for eastside residents were a quality place to live, outdoor recreation and wildlife habitat. Factors most important to national interests were wildlife habitat, and ecological health (Brunson and others 1994).

In terms of orientation toward beliefs about managing natural resources, Oregonians and the national public tended to "strongly support a less commodity-based, more ecologically sensitive approach to federal forest management" although this belief was slightly less likely for Eastside residents (Steel and others 1994, Haynes and Horne 1997). Other surveys of residents of the Interior Columbia River Basin reveal top priorities for protection of forests, rangelands and wilderness. Overall, 76 percent of the people favored protecting watersheds, fish and wildlife habitats, endangered species, ecosystems and wilderness. "Most Oregonians want the forestland of the state to be managed for a balance of social, economic and environmental benefits" according to a recent survey commissioned by the Oregon Department of Forestry (Oregon Department of Forestry 2001).

Human Health and Safety

People are concerned about effects to human health and safety of residents living near the watershed due to smoke emissions during burning. Primary issues focused on potential smoke from fires in the high fire hazard areas and concerns with air quality to people residing in Greenhorn Bates, Austin, and Austin Junction areas. Other concerns emphasized health effects to workers from chemical treatments of competing vegetation. Safety concerns to workers and the public about

hazard trees along roadsides were also raised as concerns (see also 3.4.2 Austin, Bates and Greenhorn, page 212).

Timber Management

Timber management has held an important role in this watershed over the past century beginning with the previously mentioned railroad logging along the Middle Fork of the John Day River valley in around 1905. Today, timber harvesting is an vital tool for meeting resource objectives, from thinning overstocked stands, to salvaging fire, wind storm, and insect killed trees.

Locally, lumber and wood manufacturing industries directly account for 18 percent of the total wages in Grant County (Summit FEIS). There is an indirect effect timber industries have on other job sectors, especially retail industries. In the past decade as timber harvesting levels on the Forest have declined, revenue distributed to county schools and road budgets has also declined, as a portion of Federal Timber Sales went to Counties for schools and roads. Schools and roads are no longer funded in this manner as Congressional legislation has altered this method of payment. Retail business continues to benefit from timber industry, as does local government in the form of property taxes.

Within the project area timber sales such as Moe Timber Sale contribute to the local economy and provides vegetation restoration. Should a decision be made to forego the current recommended action, other timber sales may occur after appropriate planning in subwatersheds throughout the project area.

Declining trends in timber harvesting from National Forest System lands indicate that declines in wood products employment may continue over the next two decades. In the long-term (20-40 years), employment is predicted to stabilize and then increase matching an increase in timber harvesting. In response to an agency decision about carrying capacity and resource protection, historic levels of livestock grazing would most likely continue to decline over the next 20 years. In the future, recreational use is expected to continue to increase as population continues to grow in the region and demand for opportunities continues on a national scale. Competition for water used for hydropower production, irrigation, domestic water supply and instream flow needs are expected to become increasingly controversial and complex to meet the future needs of the ecosystem (Haynes and Horne 1997).

The area recommended for commercial harvesting within the Southeast Galena Restoration Project was analyzed to determine the economic viability of harvesting timber by determining the tentative advertised bid rates per hundred cubic feet ($/ccf). This estimate was based on estimates of volume, species, amount of saw timber and fiber material, logging systems costs, haul costs, road maintenance costs, contractual costs, erosion control and other developmental costs, temporary road costs, and specified road construction costs, and the value of timber recommended for removal. The preliminary value of the timber was based on the prices for the same species and material of all sales actually sold within Appraisal Zone 3 (primarily Blue Mountain forests) within the last 12 months.

The tentative advertised bid rates estimated reflect the most current volume, price and costs estimates for this analysis. An initial bid rate was determined by subtracting the costs associated with logging from the base period prices adjusted for the quality of the material and current market conditions. This rate was further reduced per current appraisal methods (Transaction Evidence Appraisal) to allow for competition between bidders to determine the tentative advertised bid rate. The computer software program, TEA_ECON was used to conduct the analysis.

Economic Efficiency

An economic efficiency analysis was completed that focused on identifiable and quantifiable ecosystem benefits and costs for each alternative in terms of the present net value (benefits minus costs) to assess which alternative comes nearest to maximizing net public benefits (36 CFR 219.3). Ecosystem functions provide a broad set of ecosystem services such as clean water or native forest stands that are valuable to both human and nonhuman components of the ecosystem. These ecosystem values may be assessed in economic and non-economic terms. Economic valuation provides a partial measure of the full range of ecosystem values in commensurate terms for assessing economic tradeoffs. Non-economic values are necessarily assessed in terms relevant to other disciplines such as ecology or ethics. Changes in ecosystem services must be measurable and quantifiable in like terms, preferably monetary measures, in order to assess a relevant change in economic value (Bergstrom and Loomis 1999).

This analysis is based on identifiable and quantifiable economic benefits and costs and is more typically a financial comparison between revenues and costs. The objective of the economic efficiency analysis is to show a relative measure of difference between alternatives based on direct costs and values used. All dollar values have been discounted in terms of the present net value (2001 dollars). Discounting is a process whereby the dollar values of costs and benefits that occur at different time periods are adjusted to a common time period so that they can be compared. The real (exclusive of inflation) discount rate of four percent was used in the analysis over the planning period.

Present net value is defined as the present (discounted) net value of project benefits minus the present (discounted) net value of project costs. A benefit-cost ratio is the ratio of present net benefits to present net costs. Present net value is a more appropriate measure for comparison between alternatives when land and productive activities are limiting such as in an environmental analysis of alternatives. A benefit-cost ratio comparison is more appropriate when investment capital is limited, for example when considering budget allocation among a number of different activities. Refer also to the Malheur National Forest, FEIS, Appendix B, for a comprehensive quantification of the net public benefits for the *Land and Resource Management Plan*.

Recreation

Today, many people who enjoy a variety of outdoor activities use the project area. This use takes place in the Middle Fork John Day River Area, despite the historic condition of open park-like stands of large Ponderosa Pines and western larch not being present. People go to the project area for recreation and do not give much thought to how the forest once looked. People experience the area as it is, with many recreational opportunities. Trail uses include mountain biking, snowmobiling, horseback riding and stock packing, ATV users and hikers. Campers use developed campsites and participate in dispersed camping throughout the area. Hunting big game animals (deer and elk) and fishing are also activities that occur. Firewood and Christmas tree cutting, gathering berries, gathering mushrooms, horn hunting (hunting for the shed antlers of deer and elk) and other activities occur as well. Viewing scenery and enjoying the landscape is a part of all of these activities.

Trails developed for recreational use provide users with an interaction in the environment at a slow pace, a closer look at nature, and perhaps a more personal experience. Camping sites are temporary living spaces that envelope the user thoroughly in a forest environment. These places often become special places that are highly valued and sought after due to an experience that is more than simply a visual image or viewing activity. The landscape provides an experience rich in meaning and value.

Access is key to how outdoor recreation resources are used. Recreation sites easily accessed by vehicle have higher visitation rates than those located in remote, roadless areas. See ISSUE 1.4.1—Restricted Access, page 30.

Recreation Opportunity Spectrum (ROS)

The project area has motorized opportunities from roads built during timber harvest and mining activities from past decades; however, Access Management Plans have reduced these roaded opportunities over the last few years. The project area is managed as semi-primitive non-motorized, semi-primitive motorized, roaded modified, and roaded natural. Recreation opportunity acres are divided between the motorized (43,740 acres) in the summer time, (48,329 acres) in the wintertime, and non-motorized (4,589 acres) categories.

Based on the seven elements, the Forest Service assigns one of six ROS settings zones to all National Forest land; four of these apply to the project area.

ROADED MODIFIED (RM)

A natural environment substantially modified, particularly by vegetation and landform alterations. There is strong evidence of roads and /or highways. Frequency of contact is low to moderate.

ROADED NATURAL (RN):

A natural-appearing environment with moderate evidence of the sights and sounds of humans. Such evidence usually harmonizes with the natural environment. Interaction between users may be moderate to high with evidence of other users prevalent. Motorized use is allowed.

SEMI-PRIMITIVE NON-MOTORIZED (SPNM):

A natural or natural-appearing environment of moderate to large size. Concentration of users is low, but there is often evidence of other users. Use of local roads for recreational purposes is not allowed.

SEMI-PRIMITIVE MOTORIZED (SPM):

A natural or natural-appearing environment of moderate to large size. Interaction between users is low, but there is often evidence of other users. The opportunity exists to use motorized equipment.

Table 116 Estimated ROS Acres

ROS Setting	Existing
SPNM/SPM	4,598
Semi-Primitive Motorized(SPM)	10,056
Roaded Natural (RN)	21,769
Roaded Modified (RM)	11,915

Recreation Sites

There are 118 recreation sites including dispersed campsites identified and mapped within the project area. Other sites are present, but are not mapped in a current data base. It is useful to keep in mind that activities vary in importance over time. Therefore, dispersed sites that are presently in use today may not be in the future. So this data is valid only over an intermediate length of time. The majority of dispersed campsites are within riparian areas with little evidence of water quality impacts and concerns. Two sites along County Road 20 have been identified as needing corrective measures as they are causing resource damage to Middle Fork of the John Day River with Threatened fish species (see 1.2.1.3 Undesired Condition: Damaged Aquatic Habitat page 11).

MIDDLE FORK CAMPGROUND

Middle Fork Campground is located on County Road 20 along the Middle Fork John Day River in the Tincup Ck/Little Butte Ck subwatershed. Middle Fork is a developed fee campground with 10 campsites and receives moderate use. This campground is used consistently throughout the use season, but use is higher during the big game hunting seasons. There are 2 newer type vault toilets provided, but no drinking water is available.

This campground has rustic structures with a moderate challenge for access for people with disabilities. The camp-pads are hardened and the road rocked with boulder placement to prevent vehicle access to the Middle Fork of the John Day River. The campground can accommodate vehicles with trailers but there are limited sites for motor homes. A Vegetation Management Plan was done in 1997 with a prescription of 80-120 ft/A basal area with another entry planned in 15-20 years. The stand is generally composed of ponderosa pine with western larch and there are Douglas-fir present as well. The campground is within the Middle Fork John Day River riparian area with minimal impacts to the riverbank. (See Chapter 4 .1.2.1, page)

CAMPGROUNDS: DEERHORN FOREST CAMP (CAMPGROUND)

Deerhorn Forest Camp (Campground) is a non-fee campground with facilities typical of developed campgrounds. Deerhorn is located on County Road 20 along the Middle Fork John Day River, has 5 sites with fire rings, picnic tables, and one vault toilet.

This is a Forest campground but it is not a fee campground and is currently sustaining high use(see Recreation Interface with Aquatic Habitat, page 139). No drinking is water available at this campground.

This campground has rustic structures with a moderate challenge for access for people with disabilities. The road is rocked with only one of the five camp-pads rocked. Only one of the camp-pads is currently developed; the other 4 are undeveloped. The site can facilitate vehicles with trailers, but has limited sites for motor homes. The Forest Camp is within the Middle Fork John Day river riparian area and has some evidence of impacts to bank stability from current use at the upper campsite. This site is continuing to erode approximately 20 feet of riverbank (see Recreation Affects in RHCAs, page 136).

TRAILS AND TRAILHEADS

BLACKEYE TRAIL 243

The Blackeye Trail (number 243) beginning at the Trail Head is 2.4 miles long; with a difficult level and a ROS class of semi-primitive non-motorized[66] (summer); semi-primitive motorized[67] (winter) for snowmobiles. This is a designated foot; horse and bicycle trail with undeveloped snowmobile use in the winter. The route lies in the Vinegar Hill Indian Rock Scenic area. The west end trailhead is located on Forest Road 4559 at Lemon Cabin. The east end trailhead is located on Forest Road 2010219, which is steep and has 12-inch deep ruts in the roadbed. This road is quite difficult to access especially when pulling horse trailers. The existing trails (not including the existing road) are in fairly good condition and only will require maintenance.. The Blackeye trail/trailhead lays in the

[66] **Semi-Primitive Non-Motorized:** A natural or natural-appearing environment of moderate to large size. Concentration of users is low, but there is often evidence of other users. Use of local roads for recreational purposes is not allowed

[67] **Semi-Primitive Motorized:** A natural or natural-appearing environment of moderate to large size. Interaction between users is low, but there is often evidence of other users. The opportunity exists to use motorized equipment.

north half of Galena Watershed in the Granite Boulder, Little Boulder Creek /Deerhorn, and Vinegar Creek subwatershed.

DAVIS CREEK TRAIL/TRIAL HEAD 244

The Davis Creek Trail (number 244), beginning at the Trailhead is 11.8 miles long with a difficult level and a ROS class of Roaded Modified (RM). This is an all purpose trail with a designation of foot, horse, bicycle, and 2-wheeled motorcycles. The route lays in general forest with easy access. The trail is in the south half of Galena watershed in the Davis Creek/Placer Gulch, Little Boulder Creek/Deerhorn, Tincup Creek/Little Butte Creek, and Butte Creek subwatersheds.

All Terrain Vehicles (ATV) currently use the trail and use is currently high and increasing. Due to inadequate trail width current use may not be safe as the entire length does not meet trail guide specifications for ATV use. The entire trail length of 11.8 miles is less than standard width and would require major reconstruction to meet the guides for ATV use. The Davis Creek Trail fords Butte Creek three times and has water quality and fish concerns at each of these crossings due to ATV use. Currently, there is resource damage occurring in other stream crossings along segments of the trail and inadequate bridge crossings (see **ISSUE 1.4.2—Effects of All Terrain** Vehicle (ATV) use; page 31 and Davis Creek Trail; page 136). Two of the three trailheads on the west end are inadequate. Forest Road 2050032/666 for approximately 1.6 miles is a native surface road with some deep potholes. There are limited opportunities for ATV trails in this project area—other than the existing Davis Creek Trail.

DAVIS CREEK BICYCLE TRAIL

The Davis Creek Bicycle Trail is 23.4 miles long with a more difficult level. The biggest portion of trail is on existing open roads and is completely functional, but is need of signing. The bicycle trail is located 10 miles west of Austin Junction on County Road 20 this trail travels through Butte Creek, Tincup Creek, Little Boulder Creek, Deerhorn Creek, Davis Creek, Placer Gulch Creek and Placer Gulch subwatersheds in the Project Area.

TEMPEST MINE TRAIL 256

The Tempest Mine Trail (number 256) beginning at the Trail Head is 3.5 miles long; with a difficult level and a ROS class of semi-primitive non-motorized (summer); semi-primitive motorized (winter) for snowmobiles. This is a designated foot; horse and bicycle trail with undeveloped snowmobile use in the winter. The route lies in the Granite Boulder Creek. The trailhead is located on Forest Road 4559 at Lemon Cabin.

BLACKEYE/TEMPEST MINE TRAILHEAD

In 1998 Lemon Creek blew-out Forest Road 4559 and vehicle access to the trailhead was blocked. The Blackeye and Tempest Mine trails have a common trailhead located at Lemon Cabin on Forest Road 4559. The road was blocked at Forest Road 4559 and 4559283 with a pole barricade. Trail and trailhead access from this point is by foot traveling up Forest Road 4559 for approximately 1.25 miles. The portion of Forest Road 4559 that was converted into part of the trail just past Lemon Cabin crossing Granite Boulder creek needs rehabilitation work done to the roadbed to stop the rutting which is occurring at this location and contributing to water quality concerns. Trailhead concerns include the concern that there is no accessibility for the Lemon family to their Existing cabin

PRINCESS TRAIL/TRAIL HEAD 251

This trail is located in the North half of Galena Watershed in the Granite Boulder subwatershed. Only 1 mile of trail and trailhead lies in the project area.

The Princess Trail is 9.3 miles long; with a more difficult level; a ROS class of semi-primitive nonmotorized (summer); semi-primitive motorized (winter). This is a designated foot, horse and bicycle trail that has undeveloped snowmobile use in winter. The route lies in the Vinegar Hill-Indian Rock Scenic Area with a portion of trail in the Granite Boulder subwatershed. The west end trailhead is located on Forest Road 4500537 at Head O' Boulder Forest Camp. The east end trailhead is located on Forest Road 2010148.

The east end trailhead is on Forest Road 2010148. In the *Land and Resource Management Plan,* management closed Forest Road 2010148 to vehicle access and was converted to a hiker/horse trail. The current trailhead is an undeveloped small turnaround. Planned reconstruction is to occur in the futures, upgrading this trailhead to accommodate 2 vehicles with trailers along with three to five parking slots, and a gate across the road. The road leads to private land, and the landowner has vehicle access under a Closed Road Permit. West end trailhead is on Forest Road 4500537 at Head O' Boulder Forest camp. This trailhead is not within the planning area.

PRINCESS TRAIL BICYCLE TRAIL/251

This trail is located in the North half of Galena Watershed. In the Granite Boulder Creek, Little Boulder Creek/Deerhorn Creek, Vincent Creek, Vinegar Creek subwatersheds.

The Trail is 47.7 miles long with a more difficult level. This bicycle trail is located 2.3 miles from the junction of County Road 20 and Forest Road 2010. The biggest portion of trail is on existing open roads and is in need of signing.

VINCENT SNOWMOBILE TRAIL/257

North half of Galena Watershed. In the Vincent Ck and Vinegar Ck subwatersheds. The Trail is 12 miles long. Route lies on Forest Road 2010 and Forest Road 618. The trail is under an Memorandum of Understanding(MOU)with the Sumpter Valley Snowmobile Club for maintenance requirements and grooming.

BRIDGE CREEK SNOWMOBILE TRAIL 256

This trail is located in the South half of Galena Watershed in the project area in the Davis Creek/Placer Gulch subwatershed. The Trail is 9 miles long and its Route lies on Forest Road 011, 033, 570, 485 and 361.

The trail is under an MOU with the Sumpter Valley Snowmobile Club for maintenance. Trail is not a groomed trail.

VINEGAR HILL-INDIAN ROCK SCENIC AREA

The Vinegar-Hill-Indian Rock Scenic Area has 4,137 acres that falls within the Project Area, this portion of the 17,234 acre scenic area is part of 13,322 acres administered by the Blue Mountain Ranger District of the Malheur National Forest. Two other National Forests share the remaining one third of administrative responsibilities of this area. The area is drained by the Middle Fork of the John Day River on the Malheur National Forest, the North Fork of the John Day River on the Umatilla National Forest portion, and the Burnt Powder River on the Wallowa-Whitman National Forest

portion. The recreation experience in Vinegar Hill-Indian Rock Scenic Area has a Recreation Opportunity Spectrum (ROS) classification of semi-primitive non-motorized and semi-primitive motorized during the winter, (see definitions page 228). This area is managed for semi-primitive non-motorized guidelines and the Recreation Opportunity Spectrum (ROS) boundary will remain the same. The Vinegar Hill-Indian Rock Scenic Area is indicated as an area providing "outstanding natural aesthetics" and should be, "preserved and protected." The *Land and Resource Management Plan* indicates retention as the visual quality objective for this area. The Summit Fire burned a significant portion of this area.

3.4.4—Heritage Resources

Currently, the Southeast Galena project area contains 135 heritage resource sites. The documentation of these properties has occurred during surface surveys that were conducted in the Butte Tincup/Little Butte, Vinegar, Vincent, and Little Boulder/Deerhorn subwatersheds in support of restoration projects. A majority of the cultural resource properties in the planning area are mining and railway logging related sites. Many of these sites occupy large segments of the landscape and provide forest visitors with a visual connection to key periods in the history of northeastern Oregon.

The prehistoric sites in the Southeast Galena Project area are exclusively lithic scatter properties that are valued in light of their potential to provide scientific data to anthropological and paleo-environmental research efforts. These lithic scatters are generally small (less than 5 acres) and display sparse assemblages of formed stone tools, reduction flakes, and occasionally ground stone. Several display potential for buried archaeological deposits.

The landscape of the Southeast Galena planning area has been highly influenced by mining activities, which began in 1864 and continue, at far less active levels to the current day. Mining landscape features such as placer tailings, waste rock piles, hydraulic ditch systems, prospect holes, adits, and shafts, are common throughout most of the subwatersheds in the planning area. Built mining related properties, such as: cabins, flumes, and mills or other ore processing localities are also commonplace, particularly near historic claims. Mining related resources could be considered valuable due to their data potential and/or their ability to visually convey their associations with important historic events or people.

Railroad logging has also played a prominent role in the history of the watershed. The Oregon Lumber Company constructed narrow gauge railway from the town of Bates down the Middle Fork of the John Day River toward the mining towns of Susanville and Galena in 1916. Use of the Middle Fork line was discontinued in 1945. Railroad logging site types in the project area include: linear segments of railroad grade in various conditions, trestles and other earthwork engineering features, and remnant logging camp/temporary occupation sites. Spurs of this system extend from the mainline up major tributaries of the Middle Fork such as Vinegar Creek, Flat Creek, and Butte Creek. Remnant railroad logging camps are located in the Vinegar Creek and Flat Creek drainages.

Table 117 Documented cultural resource sites in the Southeast Galena Project area by subwatershed.

Subwatershed	Prehistoric sites	Historic mining sites	Historic RR logging sites	Miscellaneous Historic sites
Placer/Davis	2	17	8	1
Tincup/Little Butte	9	3	6	1
Granite/Boulder	2	10	0	1
Little Boulder/Deer Horn	6	4	7	0
Vincent	2	13	4	0
Vinegar	3	18	2	0
Butte	2	5	1	1

3.4.5—Roads (see Appendix G Map 33 Existing Condition)

Both open and closed roads that are improperly located frequently impact stream conditions. In Riparian Habitat Conservation Areas (RHCAs), roads may restrict stream meandering nature of streams (or sinuosity). In addition, roads can reduce riparian vegetation which provide fish habitat and wildlife refuge. Some road segments act as sediment sources, delivering increased loads to downhill portions of neighboring streams. Poor road location, improper construction, inadequate culvert size and functioning capacity, as well as a lack of road maintenance are examples of the conditions, which have contributed to these sediment problems. Generally, roads alter, concentrate, and intercept water flow across the landscape, augmenting peak flows in spring, and reducing late summer flows during a naturally dry time when water is needed most. Many of the roads were built on former railroad grades that were the means of early logging in the project area.

The *Land and Resource Management Plan* (LRMP) for the Malheur National Forest (1990) displayed projected timber harvest of over 200 MMBF annually. Amendments to the plan, listing of Threatened, Endangered and Sensitive species, and other recent developments have drastically constrained the amount of annual timber harvest from the Forest. As a result, the opportunities to reconstruct and maintain roads in conjunction with timber harvest activities have declined drastically during the past decade. In addition, the Cooperative Work Forest Service (CWFS) trust funds that are accumulated through deposits generated from log haul have also declined drastically within the same timeframe. A cursory comparison between the Forest funds available for road maintenance a decade ago, relative to what is available currently, indicates that the total dollar figure has not changed significantly. However the Forest has taken on the road management for the Snow Mountain District, which added over 2000 miles of roads, and the dollars per mile needed to accomplish the work has increased steadily with inflation. This has resulted in the Malheur National Forest having far less funding ability, with the responsibility to maintain a significantly larger number of road miles. Consequently, in recent years most of the available funding has been directed towards maintaining the Forest Arterial and Collector roads (Level 3 to 5 roads), that receive the highest traffic use. In the interim, the maintenance needs of local roads (Level 1 and 2 roads) have been mostly deferred, because the funds to maintain the roads to standards are simply unavailable. The overall result is that most of the Forest road system is in a downward or deteriorating condition. This applies to most of the Level 3 to 5 roads, and even more to the Level 1 and 2 roads. Recent road condition surveys indicate a majority of the roads in the Southeast Galena project area need to be reconstructed to meet both user safety needs as well as water quality concerns. Adverse effects of roads can include contributing sediment to streams, disturbing big game (during hunting season,

harsh winters, and calving seasons), removing forest land from production, increasing the spread of noxious weeds, and changing the recreational experience. Benefits of roads can include opening areas for recreation users, allowing access for commodity utilization, and allowing access for resource management. The Southeast Galena Project Area also includes a relatively large number of roads that are either no longer needed for management, or are causing unacceptable resource impacts. Given the existing funding situation for road maintenance such roads are logically the first consideration for decommissioning. Existing open road densities in the Southeast Galena project area, generally meet, or exceed *Land and Resource Management Plan* Standards. The Galena Watershed includes 450 miles of system roads, of which about 267 miles are within the project area. This may represent substantially more roads than are needed for all users of this area. Some of the existing roads are located in riparian areas, and many of these roads are contributing to stream sedimentation, increased stream temperature, and are not suitable for future access. In some instances, use of unsurfaced roads during wet weather in spring and fall is adding to the level of stream sedimentation. At the end of this document see Appendix G Roads Analysis, and Map 32 existing condtion.

3.4.6—Local Communities

Some people feel that restoration work can provide long-term employment for local residents who have traditionally been employed by timber-harvest related employment. Restoration activities require skilled labor and equipment that can support employment in local communities. The definition of communities can generally be characterized as either geographically based places, or like-minded groups of people who form relationships or communities of interest, or a combination of both (Society of American Foresters 1989, Beckley 1998). Most of the concern related to restoration related employment raised during scoping focused on communities in Grant County.

For purposes of this analysis, “community” describes the spatial location of groups of people living in the rural areas directly adjacent to the Southeast Galena Project area or in surrounding Grant County. People in these communities have expressed concern about their ability to adapt to rapid changes in their environment from mill layoffs or closures, and resulting changes in their social organization such as drop in school enrollment as the population declines from people leaving the area to find work..

Photo 20—Austin, Oregon viewed toward project area.

Remaining in the Austin/Bates area are a number of local residents of the town of Austin; employees of the Austin Section, of the Oregon State Highway Department; fire crews made up of summer employees of the U.S. Forest Service, stationed at the Blue Mountain Work Center; a tavern, restaurant, store and gas station called, "The Austin House," and several homes built on permitted lands managed by the Malheur National Forest. Currently, approximately less than thirty-five people live within a five mile radius of Austin.

The town of Greenhorn was once a timber and mining town, as well. Today, residents who remain are mainly involved in mining activities, or are part-year summer-home residents. Greenhorn is located only three to four air miles northeast of the Southeast Galena project area. Approximately 15 home sites exist and phone service was recently provided. The town of Greenhorn is incorporated, although there are very minimal services for the three permanent residents.

3.4.7—Social Values and Beliefs

Information about people's attitudes, beliefs and values and their changing perceptions about past, present and future needs and expectations is important to fully understand the impact of the project proposal on the human dimension.

Although no surveys of people have been completed for the Southeast Galena Restoration project area, public comments and concerns indicate a range of spiritual and aesthetic values associated with the area. For example, scenic quality is particularly emphasized in the Vinegar Hill-Indian Rock Scenic Area, and the Dixie Butte Roadless Area provides opportunities for solitude and personal renewal. Some "places" such as Lemon Cabin are referred to by a variety of people associated with the project in the context of geographic, cultural or historical values.

In a survey of Oregonians and national public and their values regarding natural resources, respondents identified protecting resources for future generations as the most important factor. The three most important factors for eastside residents were a quality place to live, outdoor recreation and wildlife habitat. Factors most important to national interests were wildlife habitat, and ecological health (Brunson and others 1994).

In terms of orientation toward beliefs about managing natural resources, Oregonians and the national public tended to "strongly support a less commodity-based, more ecologically sensitive approach to federal forest management" although this belief was slightly less likely for residents of Eastern Oregon (Steel and others 1994, Haynes and Horne 1997). Other surveys of residents of the Interior Columbia River Basin reveal top priorities for protection of forests, rangelands and wilderness. Overall, 76 percent of the people favored protecting watersheds, fish and wildlife habitats, endangered species, ecosystems and wilderness. Most people want a protective ecosystem approach and do not favor commodity production as the primary management of public lands (Rudzitis et al 1995). Beliefs held by members of local communities which have been accustomed to economic advantage from commodity values derived from National Forest land often differ from regional and national opinions, of those who have no economic stake locally. The viewpoint in local communities, therefore, would hold a different outlook from any notion of passive or non-use values prevalent in national values, beliefs, or attitudes.

3.4.8—American Indian Tribes

American Indian Tribes are concerned about effects to their treaty rights and interests in the area. Changes in road access, trail access, vegetation treatments may affect tribes treaty rights and interests.

The Confederated Tribes of the Warm Springs Reservation; and the Confederated Tribes of the Umatilla Reservation; as well as the Burns Paiute Tribe retain rights (see **1.5.1—Applicable Laws and Treaties**, page 35) in the Middle Fork area. These American Indian Tribes—all use the Malheur National Forest, for hunting, fishing, gathering, and religious purposes. Many still use traditional areas in the region (including the project area) for hunting fishing and gathering (see 3.2.6.4.6—Culturally Significant Plants, page 202). Chokecherry is an example of an important traditional food. Hunting for a variety of mammals and fishing with a current emphasis on trout are important subsistence activities for tribal members. Access by road is important especially for elders with limited mobility (Burns Paiute Tribe 2001).

The USDA Forest Service shares in the federal government's overall trust responsibility to Indian tribes where treaty or other legally defined rights apply to National Forest System lands. In redeeming this shared responsibility, the agency assists in carrying out the intent of the treaties and other obligations, by operating in a just and responsive way; making efforts to adjust the management of National Forest System lands in favor of the concerns of the respective Indian Tribes, as far as practicable, while still maintaining a responsibility to all the people—the general public. These actions and adjustments need to be carried out through consultations with tribal officials or their designees, on a government-to-government basis (McConnell 2001).

3.4.9—Environmental Justice

The population of the area is predominately white, followed by American Indians depending on the particular county. The region is sparsely populated, and contains low populations of minorities. Ethnic minorities include Hispanic groups and distribution of minority groups varies widely across northeastern Oregon (refer back to Figure 3).

Poverty rates provide some indication of the percentage of the population in surrounding communities with low-incomes. All of the counties surrounding the project area have higher than average populations living in poverty except Gilliam (9.4 percent) and Morrow (7 percent). The other counties have average poverty rates of 19.6 percent (Malheur), 16.8 percent (Baker), 15.6 percent (Umatilla), 15.6 percent (Asotin), 14.8 percent (Harney), 14.5 percent (Grant), 14.5 percent (Walla Walla), 13.1 percent (Wallowa), 13.9 percent (Union), 12.5 percent (Wheeler), 12.5 percent

(Columbia), and 10.9 percent (Garfield). The Oregon statewide average rate of persons living below poverty is 11.6 percent (Oregon Employment Department 2001).

Data regarding minorities or people with disabilities employed in the region in the timber, mining, ranching, road construction, forestry services and recreation sectors is unavailable. Some firms contracted by the Forest Service for reforestation work have traditionally hired Hispanic workers that comprise a migratory workforce in the area. A certain amount of contracts are reserved for award to minority businesses under the USDA Office of Small and Disadvantaged Business Utilization and the Small Business Administration although overall contract amounts to these groups has declined since 1998 (USDA 2000).

Hispanics—Information on uses of National Forest System lands by Hispanics in the project area is unavailable, but surveys of users in the Southwest and California reveal that families with extended members as part of the social unit seek recreation opportunities that fit all ages for maximum number of people and interactions. Short, intense trips typically on major holidays to specific developed spots are common. Subsistence harvest of natural resources such as trees, shrubs, herbs, grasses, roots, tubers, berries and large and small game are important for food, fuel, building materials, tools, clothing and medicine (Garcia 1999).

African Americans—African American use of the analysis area is unknown, but studies indicate this group recreates mostly in parks and forests closest to urban areas with developed facilities (Johnson 1999).

Asian and Pacific Islanders—Past information on uses by Asian and Pacific Islands include commercial mushroom harvesting and developed camping associated with this activity. Family groups typically camp together or in large groups sometimes occupying entire sites. Established Asian and Pacific Islander American groups collect mushrooms as a fall ritual for personal use (Otani and Shon 1994).

Persons with Disabilities—Universally accessible sites are important to meet the standards for the Americans with Disabilities Act (ADA). The primary concern raised during public scoping referred to maintaining motorized access for scenic driving, wildlife viewing or big-game hunting. Accessible facilities include one toilet at Deerhorn Campground, and two accessible toilets and two designated parking sites at the Middle Fork Campground in the project area. Many disabled persons value undeveloped areas and enjoy experiencing the natural world as a place they can escape the societal stigma of other people (McAvoy and Lais 1999).